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NOTICES.—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Facts about Sulphuric Acid Production

IN commenting upon the figures of sulphuric acid production in this country for the year ended June 30 last, some little confusion has been caused by the failure to notice that figures which were assumed to refer to a year's production actually covered only six months, and the conclusions therefore require to be corrected accordingly. The actual figures are given below:—

Sulphuric acid made (as 70% H_2SO_4)	1913.	1921-22.	1922-23.	1923-24.
tons	1,500,000	985,000	1,225,000	1,272,000
Percentage of plant capacity used	85·0	48·0	62·0	63·0
Raw materials used:—				
(1) Pyrites ...tons	800,000	358,000	365,000	350,000
(2) Spent oxide ,,	110,000	129,000	157,000	148,000
(3) Sulphur .. ,,	3,000	16,000	45,000	66,000

During the last few years a considerable change has been noticeable in the raw materials used, and this is clearly illustrated in the following table, which gives the percentage manufactured from each of the principal raw materials:—

Year.	Acid (including Oleum) made, as 100% H_2SO_4 Tons.	Percentage Made From— Pyrites. Imported.	Domestic.	Spent Oxide.	Sulphur.	Zinc Fumes.
1914	1,082,000	88·5	0·45	10·6	0·3	0·15
1917	1,382,000	79·9	1·7	11·0	8·1	0·30
1918	1,130,000	79·4	1·6	11·2	7·4	0·40
1919	883,000	80·3	0·8	15·9	1·8	1·2
1920	1,053,000	80·4	0·9	16·7	1·2	0·8
1921	560,000	71·0	1·0	24·0	3·6	0·4
1922	817,000	61·8	1·1	25·5	9·6	2·0
1923	873,000	51·1	1·1	23·2	21·5	3·1
1924 (to June)	485,000	53·0	1·2	21·0	22·1	2·7

It will be seen from these figures that, although the total production of 70 per cent. sulphuric acid has increased in the last three years, it is still appreciably short of the figure for the last pre-war year, 1913. On the other hand, the percentage of plant capacity in use, which has also increased slightly during the last three years, is very considerably lower than that for 1913, the comparative figures being 63 per cent. and 85 per cent. As regards the raw materials used, some very important changes have to be noted. In 1913 the industry absorbed 800,000 tons of pyrites; the figure for last year is 350,000 tons, representing a slight decline on the figures both for 1923 and 1922. The position is reversed in the case of spent oxide. The amount used—which was 110,000 tons in 1913—rose to 129,000 tons in 1922, to 157,000 tons in 1923, and stands at 148,000 tons in 1924. But the most remarkable change of all is in the use of sulphur. In 1913 only 3,000 tons was used; in 1922 the amount had risen to 16,000 tons; in 1923 the figure was 54,000 tons; last year it stood at 66,000 tons.

The present output of sulphuric acid, it must frankly be said, cannot be regarded as satisfactory. The real explanation, of course, is slackness of trade, for the consumption of sulphuric acid is a recognised index to the state of other industries. Before the war production at times was as high as two million tons of 70 per cent. acid. The present figure is roughly about 63 per cent. of the pre-war figure. Since the termination of the war privately owned plant has been scrapped to the extent of about 220,000 tons capacity per annum, owing, as we have said, to bad trade and also in some degree to the high price of lead, making the moment a propitious one to scrap plant. No plant can be run really economically or efficiently while it is only employed to the extent of 63 per cent. of its capacity, but the policy of scrapping plant has its obvious limitations. It is expensive for one thing, and in the event of a recovery of trade the scrapped plant would have to be replaced. There is another important consideration. The cost of sulphuric acid plant in relation to annual output is very high. It is estimated roughly that at to-day's prices the cost of plant about equals the value of two years' output, and therefore we have a high capital value combined with a low annual turnover. The ideal thing might be to construct only big units and shut down the small ones, but when the geographical situation is considered the theory does not always work out as advantageously as might be thought, on account of transport and other conditions.

Reverting to the question of raw materials, spent oxide is, of course, a gasworks by-product, and the amount available depends on two factors—(1) the amount of coal carbonised, and (2) the content of sulphur in the coal. During recent years the output of spent oxide has slightly increased. The aim of the

British acid trade has been to absorb this as it is made, so that stocks do not accumulate. The stocks of a few years back have apparently now been absorbed, and the output is roughly being used up as it comes along.

With regard to brimstone, this, of course, is an expensive raw material, but being 100 per cent. material it saves carriage and handling in works, especially as there are no residual cinders (as in the case of pyrites). Being also free from arsenic, it yields a high-class acid without further purification. The demand for brimstone is practically determined by the demand for high-grade arsenic-free acid, and though the consumption has risen from 3,000 tons in 1913 to 66,000 tons in 1924, there is not much likelihood, for various reasons, of the figure going beyond 70,000 tons.

The rest of the sulphuric acid made in this country comes from arsenical pyrites, and since the other two sources represent a fairly constant figure, any variation in output promises to be mainly in that material. If, for example, a total increase should occur of, say, 30 per cent., the increased use of pyrites would probably account for 25 per cent. of it.

The present scale of production, as we have said, is admittedly unsatisfactory, but it is not easy to see any remedy except the general one of improved trade. Fortunately, however, the situation is nothing like so bad as it has been inadvertently made to appear owing to mistaking six months' figures for a full year's production.

Acid-resisting Iron

THE article by Mr. S. J. Tungay, in our Monthly Metallurgical Section, on the application of acid-resisting iron in nitric acid plant construction concisely summarises the gradual change from the use of pottery, stoneware, and glass to the adoption of modern iron silicon alloys such as "Ironac," "Tantiron," "Duriron," etc. It is remarkable, as he now points out, that while sulphuric acid makers had the appropriate metal for their purpose in lead, nitric acid firms, until the comparatively recent introduction of high silicon irons, had no corresponding metal which satisfactorily met their needs. Apart from the remarkably high passivity of these alloys to nitric acid and nitrous gases, they have, as Mr. Tungay claims, the additional advantages of allowing a better disposition of the plant, a higher production of stronger acid, greater facility for water cooling, and greater heat conductivity.

From these general considerations Mr. Tungay turns to the interesting problem of the special advantages of small plants, and the readiness with which acid-resisting iron lends itself to their construction. A tendency has been observed of late for users to put down small units of manufacture and condensation themselves in preference to purchasing acid from the larger manufacturers. Especially does this apply to India and the Far East and to places where the cost of transport is a serious item. On the vital question whether really small units are a paying proposition, Mr. Tungay wisely replies that the answer depends on local conditions. It is true of the small localised plant, as of the large centralised plant, that in some cases it would not pay while in others it would be exactly what is wanted. But he points to a tendency among Continental makers rather to favour a number of small units. There can be no standardised rule on the subject of the small or the big plant: the ideal position is the provision of such elastic facilities that either may be chosen according to its suitability to conditions. Mr. Tungay's point is that silicon irons make the construction of small plants easier than was once the case, especially in the areas he deals with, and anything which widens the scope of choice before the manufacturer is good for any industry.

Dr. Cottrell and Nitrogen Fixation

THIS week is concluded Dr. Cottrell's comprehensive survey of the nitrogen fixation problem in the United States and the group of subsidiary problems arising out of it. His review shows how thoroughly the Government research staff under Dr. Cottrell's control is investigating the matter, and though the United States does not at present rank with Germany or ourselves as actual commercial producers, it may, when its plans have been perfected, possibly start to overhaul its older rivals. It was in accordance with American habit that the Muscle Shoals plants should be on a gigantic scale. The scale, in fact, has so far proved impractically large, and it is interesting to find Dr. Cottrell turning to the possibility of smaller units at higher pressures. The studies at the Research Laboratory tend to the conclusion that higher pressures than those adopted in Germany are desirable and expedient, at least where the construction of new plants is under consideration. He contemplates, in fact, a practical design for a plant down to a capacity of one ton of ammonia per day, and industrial opinion so favours the idea that designs are well under way for plants of about three tons daily capacity. In these the pressures are expected to be limited to within 350 atmospheres.

While the first installation in the United States after the war was designed for 100 atmospheres, with a rated capacity of 10 tons per day, it is notable that the latest one to be installed at Niagara Falls under the Casale patents has a rated capacity of 8 tons per day and is designed for normal operation at 750 atmospheres. Furthermore, Dr. Cottrell states, duplicates of this plant are reported to be operating in other countries at 900 atmospheres, with a corresponding increase in daily output. Dr. Cottrell's review of all these points is especially stimulating because, essentially a man of vision himself as well as a first-rate scientist, he sees the possibility of so many new starting-points, both in connection with the cyanamide and with the direct synthetic process. And America cannot have active minds of this order intensively applied to the problem without ultimately bringing results to light.

It is interesting to hear, especially in connection with Dr. Cottrell's favourable opinion of high-pressure systems, that the great firm of E. I. du Pont de Nemours and Co. have acquired the synthetic process and patents of Georges Claude, and for the purpose of exploiting the process in America have organised a new company, "Lazote, Ltd.," which will handle this development and in which the Société l'Air Liquide and the Société Chemique de la Grande Paroisse, both

well-known French companies, are interested. One of the distinguishing features of the Claude process, of course, is its high pressures, ranging up to 1,000 atmospheres. The British rights in the process, it may be recalled, were secured, a few years ago, by a British company with which Mr. A. E. Barton was associated, but the scheme for exploiting it in this country never materialised.

A Retrograde Proposal

THE suggestion to reopen the Stock Exchange on Saturday mornings indicates, on the part of those who favour the idea, a lamentable want of contact with the modern business spirit. There is no real demand or necessity for it; the amount of business put through could only be trifling, and in any case quite devoid of urgency; the unhappy staffs, dragged from their suburban social activities, would be mainly occupied in finding devices for idling away the morning and excuses for adjourning to the nearest coffee shop. One could offer plenty of arguments in detail against this retrograde proposal, but the main point is that it is in direct conflict with modern progressive practice. On this subject we can speak with some experience. Benn Brothers, Ltd., were among the earliest city firms to adopt the five-days working week, and our case goes to show that a cheerful and energetic staff, thoroughly interested in their work, can put into one hour as much work as an indifferent staff, not interested in their job and mainly concerned in watching the clock, will do in double that period. Moreover, there is nothing more demoralising than to be only half employed, hanging about waiting for something to turn up. Far better for masters and men to have a shorter run at full-speed, with everybody's interest absorbed in their work.

The reopening of the Stock Exchange would be a reactionary step from all these points of view. It would bring practically no advantage to the public; it would not increase the total volume of business for brokers; it would be a purposeless penalty on officials and staffs. We can give the Stock Exchange a little advice on this point. Let them run their business on five days a week at the 100 per cent. level of speed and efficiency which we manage to attain, and they will be able, as Benn Brothers have been for some years, to take a clear week-end off with a good conscience, and come up on the Monday morning fresh and eager for another round.

A Wembley Problem

THE Wembley Exhibition is presenting a number of problems at the present time. Undoubtedly the greatest of these, and the one that attracts the most widespread interest, is the question of what is going to be done next year, but there is also a problem in the minds of many exhibitors as to exactly what has been the result of this year's display. As was pointed out in our Wembley notes recently, those exhibitors who have had anything saleable on their stands that would appeal to the general public have every reason to be satisfied with the result, their outlay having been more than returned in solid cash. Heavy chemical and dyestuff makers and engineering firms could not hope for such immediate results; but any potential buyer of chemicals or plant who has visited Wembley will obviously have been influenced in favour of goods he has seen exhibited, because he has become familiar with the name, handled the products, and probably talked with the firm's representatives. But it may be some while before he actually needs any chemical plant or material, and in the course of a year or so the names may have slipped his memory. He will turn to the obvious source of manufacturers' names, the advertisements in the technical journals, to refresh his memory. The logical conclusion, therefore, for exhibitors is to follow up their display with persistent publicity. This, of course, means further outlay, but if the Exhibition was worth entering in the first instance it is undoubtedly worth following up.

Points from Our News Pages

Dr. Cottrell's review of the nitrogen fixation position in the United States is concluded. (p. 342.)

Mr. S. J. Tungay contributes an article to our Monthly Metallurgical Section on "Acid-resisting Iron for nitric acid plant." (p. 25.)

In an article on "Lime Application in Chemical Industries" the author deals with improved methods of treating the raw materials and the many uses for dry hydrated lime. (p. 344.)

An abstract is published of a paper on alkali and chlorine manufacture in Canada, in which reference is made to the use of the Gibbs cell. (p. 346.)

Business is reported decidedly better all round in the London chemical market, with a feeling that trade is "on the eve of better times." (p. 354.)

Our Scottish market report shows that business in heavy chemicals has again been quiet and inquiries have been for small quantities only. (p. 357.)

The Calendar

Oct.		
6	Ceramic Society: "Further Experience of the Dorr Mill and Some Notes on the Swedish Felspar Industry." A. S. W. Odelberg, of Sweden. 7.30 p.m.	Central School of Science and Technology, Stoke-on-Trent.
6	Institution of the Rubber Industry: "Sulphur." Edward Anderson. 8 p.m.	Engineers' Club, Coventry Street, Piccadilly, London.
7	Institute of Metals (North East Coast Section): "The Structure of Metals in its Relation to Elastic Failure—Part I." Professor F. C. Thompson. 7.30 p.m.	Armstrong College, Newcastle-on-Tyne
7	Institution of Petroleum Technologists: "Recent Development in the Art of Cracking." A. E. Dunstan, D.Sc. 5.30 p.m.	Royal Society of Arts, John Street, Adelphi, London, W.C.2.
7	West Yorkshire Metallurgical Society Annual General Meeting, 7.30 p.m.	George Hotel, Huddersfield.
8	Liverpool Chemists' Association: "The Chemistry of Food." Dr. W. J. Melhuish.	Liverpool
8	Society of Chemical Industry (Nottingham Section): "Publicity in Chemical Industry." W. J. U. Woolcock. 7.30 p.m.	University College, Nottingham
9	Oil and Colour Chemists' Association: "The Preparation and Value of Paint and Varnish Specifications." Dr. H. H. Morgan.	National Federation of Paint and Varnish Manufacturers, 8, St. Martin's Place, London, W.C.
9	Optical Society: "Some Problems in the Theory of Optical Diffraction." E. T. Hanson. "The Annealing and Re-annealing of Glass." W. M. Hampton. 7.30	The Imperial College, South Kensington, London

The Problem of Nitrogen Fixation.—(III)

By Dr. Frederick G. Cottrell

We give below the concluding instalment of Dr. Cottrell's comprehensive survey of nitrogen fixation investigations in the United States. It will be seen that he deals, among other matters, with the possibility of smaller units at higher pressures.

ABOUT the time that the redesign of Plant No. 1 was completed, the work of Georges Claude in France, on the use of pressures up to 1,000 atmospheres, or some five times those used in the German plants, began to attract general attention, and experiments with the catalysts made by the Laboratory were begun, using pressures above the 100 atmospheres to which the present Plant No. 1 is restricted.

Fig. 8 shows some of the apparatus already used in this work to measure catalyst performance and study other reactions involved in the process up to 1,500 atmospheres, and it is planned to go to still higher pressures with these tests. The vertical cylinder in the foreground is of steel, 12 inches in external diameter and having a three-inch bore. This is initially filled with water, which is then displaced by the hydrogen-nitrogen mixture, being admitted under 200 atmospheres pressure though a valve at the top. When the bore is nearly filled at this pressure, the gas valve is closed and water is pumped in from beneath by the hydraulic pump seen behind and to the right of the cylinder. By using a similar cylinder as a storage reservoir and carefully controlling the speed of the pump, a very steady flow of gas at practically any desired pressure can be maintained from this system.

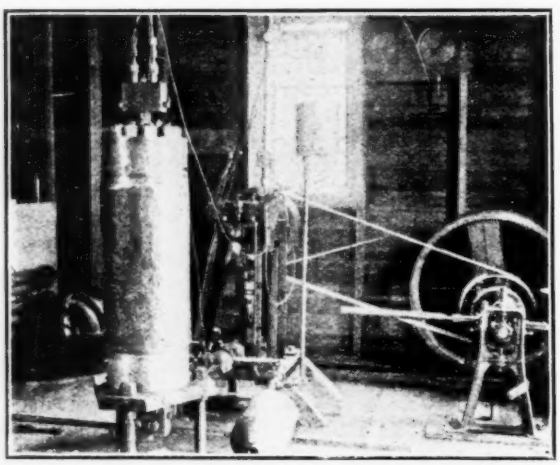


FIG. 8.—APPARATUS USED TO MEASURE CATALYST PERFORMANCE AT 1,500 ATMOSPHERES.

Smaller Units at Higher Pressures

The studies already made at the Laboratory tend toward the conclusion that higher pressures than those used at Sheffield (just under 100 atmospheres) or even in German plants (200 atmospheres) are desirable and expedient, at least where the construction of new plants is under consideration. This naturally opens up new problems, both of a chemical and an engineering nature. One of these is the feasibility of working out a practical design for plants, if possible, down to a capacity of, say, one ton of ammonia per day. The use of higher pressures is particularly significant in the design of small plants because of the question of heat balance. In the 100 atmosphere seven and one-half ton units at Sheffield, very considerable preheating of the gases by extraneous fuel before they went to the catalyst bomb was necessary in order to maintain the heat balance in the latter. In the 200 atmospheres 20 ton German units, thermal equilibrium is naturally more easily maintained, because the higher pressure means a higher percentage conversion and hence more heat developed per unit of gas passed, and both the higher pressure and larger capacity of unit decrease the ratio of conducting and radiating surface to volume of catalyst chamber. But if we are to decrease the capacity of the unit, then increase of pressure will be all the more important as a compensating factor.

The particular interest in these small units arises from the fact that there are a number of places where electrolytic hydrogen, of very good purity, is going to waste in sufficient quantity to supply plants of this size. The total output from such plants might be entirely insignificant as far as the fertiliser situation was concerned, and in fact, if their product had to be sold at fertiliser prices, they would hardly pay as a commercial proposition, but as they could be so designed as to furnish a very pure quality of liquid anhydrous ammonia direct, and for this there is a good market in the refrigeration industry at very much higher prices than for fertiliser ammonia, this presents a particularly good opportunity to get the process established in the United States and information and experience concerning it widely disseminated, as a basis for future healthy growth, to say nothing of its value as a military preparedness measure, for of all things in this industry what we most lacked in the last war were information, experience and a trained personnel. The industry is responding very cordially to this suggestion and designs are already well under way for such plants up to three tons daily capacity.

Casale High Pressure Plants

Due to the question of availability of standard gas compression machinery on the market in this country, most of these plants will, at present probably not be designed for pressures in excess of about 350 atmospheres. But as our manufacturers of gas compressors find themselves able to supply equipment at reasonable rates and guarantee its performance at higher pressures, it is more than likely that a development in this direction will be apparent, as it presents a number of advantages and the difficulties to be met are mostly such as modern engineering practice is constantly and progressively overcoming. In this connection it is interesting to note that the first installation in this country after the war, which was at Syracuse, N.Y., with a rated capacity of ten tons per day of ammonia, which it is understood has been greatly exceeded in practice, was designed for approximately 100 atmospheres, while the latest one to be installed at Niagara Falls under the Casale patents has a rated capacity of eight tons per day and is designed for normal operation at 750 atmospheres. Furthermore duplicates of this plant in other parts of the world are reported to have been successfully operated at 900 atmospheres, with a corresponding increase in daily output. The compressors and much of the other equipment for this plant were brought from Italy. This plant, which is expected to be in operation within a few months, will use electrolytic hydrogen, part of which will be a by-product from an adjacent chloride works, the remainder being supplied by electrolysing water specifically for this purpose. The Syracuse plant on the other hand employs hydrogen produced through the water gas method.

None of the ammonia produced in these plants is apt to find its way into fertiliser, as its purity and the form in which it is produced adapt it for direct use in refrigeration and in the chemical industry where it can command higher prices, but it will naturally displace an equivalent amount of by-product coke oven ammonia which was formerly refined for this purpose, and this in turn will probably go to fertiliser, so after all in the end these plants can be considered as having their effect, even if small, on the agricultural situation.

As already mentioned over sixty per cent. of the cost of producing ammonia by the direct synthetic method is ordinarily chargeable to producing and purifying the hydrogen, and in the present state of development this is undoubtedly the part of the process where there is the greatest opportunity for further cutting of costs. The electrolytic method furnishes a very pure hydrogen in one step, but is already so near its theoretical limiting efficiency as regards power consumption, which is after all its chief cost, that there seems little chance for any radical cost improvement here except in so far as

cheaper electric power can be found, and this I have already discussed.

With respect to the production of hydrogen from coal or coke and water vapour, the outlook is, however, much more favourable, and this represents a field of endeavour to which the laboratory is energetically turning its attention.

Haber-Bosch System Reviewed

Let me briefly outline in principle the process developed by Dr. C. Bosch of the Badische Anilin und Soda Fabrik, as originally used at the German plants and later installed both at Sheffield and Syracuse. Steam is passed through glowing coke. The oxygen of the water unites with the carbon, giving a gas mixture of nearly equal volumes of hydrogen and carbon monoxide with a few per cent. each of carbon-dioxide and nitrogen. This is mixed in proper proportions with ordinary producer gas, consisting chiefly of nitrogen with twenty to thirty per cent. of carbon-monoxide and smaller proportions of hydrogen, carbon-dioxide, methane and argon. Steam is added and the mixture passed through suitable heat interchangers and a hot catalyst, which has usually consisted of iron oxide containing small amounts of chromium and cerium. Here the water vapour and carbon-monoxide react to give hydrogen and carbon-dioxde. The gas now consists of hydrogen and nitrogen in the approximate proportions of one to three mixed with about thirty per cent. of carbon-dioxide, two to four per cent. of carbon-monoxide, and up to possibly one per cent. of other impurities, including the argon group, hydro-carbons, sulphur compounds, etc.

All of these, save the argon group and the hydrocarbons, but including water vapour, must be most carefully removed, for even minute traces of any of them very seriously diminish the activity of the ammonia catalyst. The carbon-dioxide has usually been removed by solution in water under high pressure, and the carbon-monoxide, together with the other objectionable impurities, later removed by treating the gas with an ammoniacal solution of copper carbonate, or formate, also after the gases were under high pressure and on their way to the catalyst bombs.

The ammonia formed in the latter must then be removed while the gases are still under pressure, either by refrigeration or by absorption in liquids or solids, and the residual uncombined hydrogen and nitrogen recirculated through the catalyst bomb, or as in the Claude system passed on through a series of bombs with successive ammonia removals between them.

Scope for Simplification and Economy

From the complexity and inter-relation of these different steps in the process as a whole, it will be seen what a fruitful field is presented for further simplifications and economies, particularly, perhaps, in the ingenious combination of steps to serve multiple purposes, not only in the process itself, but in fitting it into the place in the whole industry.

Thus, by way of illustration—can we use the carbon-dioxide, which we must remove as a by-product, to take the place of the sulphuric acid otherwise needed to put the ammonia in form to ship as fertiliser? Much study is being given this very problem, both at home and abroad. Neither ammonium carbonate nor carbamate is itself suitable as a fertiliser ingredient, but may be converted into the ideal fertiliser, urea, by heating in an autoclave. However, this reaction again does not run to completion in one treatment, resembling in this the ammonia synthesis itself, and though it has already been extensively developed on a commercial scale in Germany, has not yet brought the cost of urea down to where it can compete with ammonium sulphate as a fertiliser. The cost, however, lies in the operation and not in the raw materials, so there is still free play for the exercise of ingenuity and other aspects of common sense on the problem.

Space only permits me to mention the possibility of securing our hydrogen from the great reservoir of this material already existing in the lean gas of our by-product coke ovens. This is a whole chapter in itself, which thus far has been chiefly exploited by Claude in connection with his high pressure ammonia synthesis plants in France. Its significance lies, not alone in the very good prospect for cheaper hydrogen, but also in the stimulus it will give to technical development in extremely low temperature engineering, a too long neglected field of much economic promise; and likewise the effect it would have in further stabilising both the by-product coke and the nitrogen fixation industries by thus linking them and making it possible gradually to develop uses for the other by-products which could be incidentally extracted from the coke oven gas by the same liquefaction and distallation process which would be required to separate the hydrogen. In another decade or two the public may have quite correctly come to think of nitrogen fixation as even more closely connected with coal and the coke oven industry that it now associates these undertakings with water power.

The New "C.A." Dictionary

THE "CHEMICAL AGE" DICTIONARY OF CHEMICAL TERMS
London: Ernest Benn, Ltd. Pp. 158. 16s.

There can be few readers of modern chemical literature who have not felt the need of a handy work of reference which would explain in simple terms the meaning of an obscure or unfamiliar word or phrase. Our science is continually borrowing from sister sciences or coining terms to express new conceptions, and the use of such innovations unfortunately baffles the general reader and obscures the meaning of the writer unless their significance is rapidly broadcast. This dictionary is intended to assist the general reader of chemical literature, and will not only be a boon to chemists, but should be of immense assistance to workers in other fields who have occasionally to make incursions into the by-ways of chemistry.

The scope of the work is ambitious, it covers organic, inorganic, physical, analytical, physiological, pharmacological, electro and bio-chemistry, colloids, radioactivity and sub-atomics. The definitions given are for the most part expressed in simple language, and general terms are illustrated by specific examples. The many kinds of isomerism, for instance, are explained in a section filling four columns, catalysis in a column, the nascent state in half a column. The organic section is particularly strong, and its useful features include the numerous reactions known by the names of their discoverers, the names of the principal radicals and group names of compounds, such as glycols, phthalides, ketens. It is unfortunate that some of the terms given conform to American usage rather than to that of our own Chemical Society. For instance, *phosphinic* is used here for acids of the type RPO $(OH)_2$, not *phosphonic*; similarly *deoxy*, not *desoxy*, as a prefix. The value of the dictionary would be greater if it drew attention to such differences of nomenclature. The paragraph on the Geneva nomenclature is useful. In the inorganic section the confusion between hyposulphite, thiosulphate and hydrosulphite might have been cleared up, and in the colloidal section viscosity and terms derived from it have escaped inclusion. A few errors have been detected—e.g., the formula of o-tolidine (p. 148) and the radical acetylenyl, CH ⋮ C–, appearing as acetenyl (p. 9), but there are few such slips. The dictionary is not yet exhaustive and will no doubt be considerably expanded in a future edition, but the compilers and publishers are to be congratulated on an extremely useful volume, well printed and of a handy size. E. H. R.

"Synthetic Organic Compounds"

ERNEST BENN, LTD., announce for publication "Synthetic Organic Compounds," by S. P. Schotz, D.Sc.Tech. (Zurich), B.Sc. (Honours, London), A.R.T.C. (Glasgow), F.I.C., consulting research chemist and chemical engineer. This book deals with the manufacture, properties, and applications of a wide range of compounds of technical importance, embracing such different materials and subjects as, for example, saccharin and artificial silk, synthetic violet perfume and Bakelite or celluloid, silica gel and chloroform, chemical warfare, syntans and antiseptics. Familiar information is dealt with briefly, while anything really important, novel, and inaccessible is given in surprising detail. Owing to the hearty co-operation of the best British chemical plant manufacturers, Dr. Schotz has been able to include a large number of illustrations of almost entirely British, and at the same time thoroughly up-to-date, plant.

American Glue Import Duties

THE National Association of Glue Manufacturers of the United States is asking the Tariff Commission for an increase in the duties on imported glue. The present rate of duty is 1½c. per pound and 20 per cent. *ad valorem*. The association is asking for an increase of 50 per cent.

Lime Applications in Chemical Industries

Notes on Composition, Manufacture, and Uses

The author gives a comprehensive survey of the composition of lime, the improved methods of treatment of the raw material, and the many applications of dry hydrated lime in chemical and other industries.

THE history of the use of lime is as old as that of industry. Beginning with its applications in agriculture and in building —certainly both known to the Romans—its ease of production and wide distribution have made its useful properties available in countless manufactures. It is necessary only to consider the output of soda causticised with lime to realise its importance in chemical industry. When it is remembered that it is largely used in water treatment, the sugar industry, the leather industry, the manufacture of dyestuffs, drugs, and other organic products, of distempers, and of rubber, the wideness of its importance will be apparent.

These applications are essentially chemical, yet lime, so long known and so widely used, is, as generally met with, perhaps the crudest and least uniform of the raw materials used in chemistry. The very antiquity of the method by which lime is usually prepared, a method developed for the production of lime for mortar making and agriculture, leads us to expect a product useful enough for its original purposes, but hardly likely to approximate to definite chemical composition. In fact, lime burnt in the ordinary way from limestone contains up to fifty per cent. of material other than calcium oxide. Stones, cinders, impurities in the limestone, such as magnesia, silica and oxide of iron, cores of unburnt carbonate—these are all present in varying proportions in samples of quicklime as ordinarily prepared.

Such a product is not a heavy chemical so much as a partially treated raw material. For chemical purposes (other than metallurgical operations) it is usually slaked lime, calcium hydrate, that is really required. The lime is commonly bought as quicklime and slaked on the premises—a process involving heavy and somewhat dangerous labour and a great deal of mess. The product from the slaking of lime in this way contains all the impurities originally present in the quicklime, together with a quite indefinite and often very unevenly distributed excess of water that makes the product even less defined as a chemical reagent than was the quicklime. The composition of such a product changes rapidly owing to air-slaking.

Lime for Chemical Uses

From these considerations it is seen that lime prepared by the usual method leaves much to be desired when judged from the viewpoint of the chemical manufacturer. It is natural to inquire whether a modification of the methods of manufacture may not result in the production of lime consistent in purity and uniformity with the requirements of chemical industry.

Quicklime itself, no matter how carefully it may be prepared, suffers the disadvantages inherent in the fact of its intense chemical reactivity with water and carbon dioxide—both normal constituents of the atmosphere. Apart from the rapid deterioration from this cause of quicklime on storage, there is always present a heavy fire risk due to the great rise in temperature that may take place should water accidentally come into contact with the stored lime.

As early as 1893 V. H. Veley (*J.C.S. Trans.*, 63, 821, 1893) found that the action of carbon dioxide on slaked lime was dependent on the proportion of water present. This fact has been little recognised, but in fact calcium hydrate, so prepared that there is no free water present, is very little acted on by the atmosphere. This material, known also as dry hydrated lime, is substantially pure calcium hydroxide.

Already extensively used in America, where well-considered publicity has popularised its application both in chemical manufacture and in the building trade and agriculture, its use is increasing rapidly here. In calcium hydrate all the disadvantages of crude lime are overcome. Broadly, its advantages result from its chemical entity and from its convenient physical condition. To particularise, it is in a form of a uniform dry powder of known composition sold on a calcium oxide basis. It is thus easy to weigh out the right quantity (based on the chemical equivalent) for any particular purpose. Moreover, as has been mentioned already, the product is very little altered by exposure to the atmosphere. A commercial sample, part of an ordinary delivery, was stored under usual conditions for a year. The loss owing to air-slaking was less than five per cent., and only the layer in actual contact with the sack had deteriorated.

From this it is seen that the initial purity of the product is not materially reduced during any reasonable period under ordinary conditions of storage. The chemical purity of the product enables it to be used in many cases where the danger of introducing impurities makes crude lime unsuitable. On mixing dry calcium hydrate with water there is no marked rise in temperature. Owing to the fine state of division of the product a saturated solution of calcium hydrate is rapidly produced. The actual solubility is, of course, low, but it is quite easy to prepare suspensions of known concentration containing up to ten per cent. of actual calcium hydrate. Both the preparation and the maintenance of these suspensions is effected with a minimum expenditure of power, and in many cases they serve the purpose of a more concentrated solution. The dry state of the product and its freedom from caustic action facilitate handling and reduce labour costs. Its purity also effects saving in labour and storage, as minimum quantities have to be handled. The troublesome process of slaking is, of course, done away with when calcium hydrate is used. This alone means a further saving in labour and overhead charges. Apart from the beneficial chemical effects of the purity of the product, its freedom from stones, cinders, etc., so often met with in ordinary lime, means a great saving in operation costs. Breakdowns in agitation plant and the stoppage of valves due to these impurities are obviated.

Manufacture of Calcium Hydrate

The properties mentioned are those of the products now generally known as calcium hydrate or hydrated lime. It must be borne in mind that there is a vast difference between this substance and slaked lime passed through a sieve. The manufacture of calcium hydrate is a process requiring an expert knowledge of the chemistry of the materials dealt with. Moreover, the actual large scale production of a product of the quality necessary for chemical use is a matter of considerable technical nicety. From the selection of the raw material to the bagging of the dry hydrate, strict scientific control must be maintained. The raw material (limestone or chalk) must be analysed and its burning properties determined. The presence of much silica and alumina is detrimental for most chemical purposes. As the resulting hydrate will contain in its turn a proportion of the compounds present in the raw lime, chemical analysis must be combined with a knowledge of the purposes for which the hydrate is required, to make sure that the correct raw material is being employed. The variation in the composition of raw lime results from differences in the geological character of the carbonate from which it is made. A true limestone lime contains a high percentage of real lime (CaO) and only very small quantities of silica, alumina, and magnesia. It gives a white but very dense hydrate (sp. gr. 2-3).

The slaking properties of lime are greatly influenced by the methods and temperature of burning. In the manufacture of calcium hydrate this has to be controlled with great care to insure the desired qualities in the slaked product. A chalk lime gives a hydrate, chemically almost as pure as a limestone lime, but of a much lower apparent density (sp. gr. 1-80). When the lime is to be used as a suspension (milk-of-lime) this low density is a great advantage, as the material, having great surface development, is easy to work up into a slurry and remains in suspension much longer than the heavier varieties. A dolomitic lime produces a hydrate high in magnesia, quite unfit for most of the purposes for which the hydrate is employed. An oolitic lime gives a hydrate containing a high percentage of silica and alumina and a low percentage of real lime.

Control of Hydration Process

A suitable lime having been chosen, and the burning carried out satisfactorily, the actual process of hydration calls for accurate control. The amount of water retained by the lime must be exact, so that all the lime is converted to the hydrate.

At the same time allowance has to be made for some loss of water owing to the rise in temperature on slaking, and great care has to be taken not to add enough water to leave any uncombined water in the product, which would then be damp and thus unstable ; lumpy, and thus not susceptible of proper screening ; very little better, indeed, than crude slaked lime. Too little water, on the other hand, produces a hydrate containing small particles of quicklime, tending by air-slaking to alter the concentration of the hydrate, and so to prevent the production of a standard material. Great care, coupled with experience, both in control and in manipulation, must therefore be exercised during the process of hydration. To ensure the characteristic standard chemical composition of the product laboratory control must be maintained in each stage of the manufacture.

Industrial Applications

An attempt has been made to outline the general advantages of dry hydrated lime arising out of its superior chemical and mechanical properties. A further brief consideration of its present successful application will indicate more definitely its industrial usefulness, and, taken in conjunction with the previous statement of the product's properties, may suggest along what lines its further development is likely to take place.

As a type of chemical reaction of general industrial importance in which lime is used specifically as calcium hydrate, one may take the lime-soda process of water treatment. Here the successful use of the dry hydrate is already extensive. It is required to add to the water a definite quantity of calcium hydrate and to ensure the complete reaction of this with the alkaline earth bicarbonates, present as a very dilute solution in hard water. Of course, it is possible to use a saturated solution of the hydrate for this purpose, but the very low solubility of the hydrate renders this impracticable on a large scale. The actual addition of the hydrate is made in the form of a suspension containing up to ten per cent. of the dry hydrate. This slurry is measured out in doses by the softening machine. The advantages of the dry hydrate are apparent in the uniformity of the slurry, which is, for all practical purposes, equivalent to a standard solution, and the small power necessary to maintain the suspension. The fineness of the product reduces the time necessary for the reaction to a minimum. Addition of an excess of lime and of the impurities usually present in crude lime is avoided. Thus damage to stirring plant is avoided, there is less sludge to be got rid of, and the life of the filters is prolonged.

Calcium hydrate has great advantages over the other alkalis for the removal of dissolved carbon dioxide. The carbon dioxide is precipitated along with the lime added ; thus there is no soluble alkali left in the solution, as is the case where caustic soda is used for the purpose. Calcium hydrate is, of course, much cheaper than soda. This property is important in connection with water treatment. The free CO_2 dissolved in hard water reacts with and puts out of action quite large quantities of the soda added in softening for the purpose of removing the permanent hardness of the water. If enough calcium hydrate to remove this free CO_2 is added, in addition to that required for the removal of temporary hardness, a considerable saving in soda is effected. The alkalinity of the treated water is thus reduced.

It is not too much to say that the introduction of dry calcium hydrate into commerce has changed the lime-soda process of water treatment from what was in practice largely a hit-or-miss procedure to an exact method for the prevention of scale and corrosion in boiler plant. This result is dependent on the known initial purity of the product and its stability. Since steam raising is a basic factor of industry, this application of lime may well serve to illustrate the advantages of the pure product. Other applications have been mentioned already. In these and, indeed, wherever lime is used in a wet chemical process, the advantages of the dry hydrate are apparent. No mention has been made of the use of hydrated lime in building. Here the requirements diverge somewhat from those met with in chemical industry, but the annual consumption of hydrated lime for mortars, plasters, and concrete is already considerable and is extending. The same applies to its agricultural application.

Calcium hydrate, when properly prepared, is an alkali which takes its place alongside the other alkalis, sodium carbonate and caustic soda, as a commercial product of standardised quality. Its purity, uniformity, and stability indicate its rational classification with other industrial chemicals—whether fine or heavy the present writer would rather not venture an opinion. Its labour-saving convenience effectively opposes the manufacturer's healthy resistance to change without good reason.

Dyestuffs from Turpentine

Colours Based on Bromo-Amino-Cymene

ACCORDING to a report from Dr. A. S. Wheeler of the University of North Carolina, U.S.A., a new primary source of dyestuffs has been discovered. It is stated that Dr. Wheeler, in conjunction with Professor Taylor of the same university, has been making a far-reaching research into the possibility of obtaining a dyestuff from spruce turpentine. This is a by-product obtained from the manufacture of spruce wood into paper pulp. The turpentine comes from the paper mills as a very dark brown liquid, and is customarily thrown away. The turpentine, however, is composed very largely of cymene (methylisopropylbenzene), which in the pure form is a clear white liquid. The cymene is prepared by treating the first product with superheated steam, which carries it over as a vapour. In the purified condition it is readily converted into amino-cymene, a heavy liquid resembling aniline oil. It is stated that amino-cymene may be employed in much the same manner as aniline for the production of dyes.

On the suggestion of Dr. Wheeler, however, bromine has been introduced into the cymene group, and this product was then used to produce a new series of dyes. The bromo-amino-cymene was combined with a series of coal-tar intermediates, such as phenol, resorcinol, various naphthols and the like. Twelve new dyes in all have so far been made giving a beautiful series of colours, including yellow, peach, orange, red, scarlet, bordeaux, and orange red. It is claimed that the colours obtained by dyeing with these colouring matters have withstood severe tests for fastness. The dyes are apparently acid colours suitable for wool and silk, but cannot be dyed on cotton.

Shot-Firing in Coal Mines

A NEW order, which became operative on October 1 regarding the firing of shots in coal mines in which danger may arise from firedamp or coal dust, has been issued by the Secretary for Mines. The new requirements provide that no person may be newly appointed to fire shots unless he possesses the prescribed qualifications as regards age and practical experience underground, and that no person may be appointed whose wages depend on the amount of mineral to be gained.

The examination for gas, which has to be made by the shot-firer immediately before the firing of each shot, is specifically to include an examination for any gas issuing from the shot-hole itself and from any break within a radius of 20 yards. Shot-firing is prohibited within 20 yards of cavities and breaks that are not accessible to examination for gas contained in or issuing from them.

Every place where a shot is to be fired is to be thoroughly treated with stone dust or water unless the shot-firer is given written permission by the manager or the under-manager to dispense with this precaution. Where two shot-holes are close enough together to make it possible that the firing of one shot will relieve the work to be done by the other, the first shot must be fired before the second hole is charged. The object is to safeguard against the second hole being overcharged, as it might well be if it were charged before the firing of the first shot had shown the shot-firer the amount of work left for the second shot to do. A limited exception to this requirement is made in respect of shots to bring down the coal in long wall faces.

Canadian Carbon Black

Two permits to manufacture carbon black in Canada from natural gas fields have been granted. These are the first cases of the utilisation of the various Canadian gas wells for this purpose, all the carbon black up to the present having been obtained in the United States. Regulations in Canada require that when gas is used for carbon black production the supply for industrial and domestic use should not be interfered with.

Alkali and Chlorine Manufacture in Canada

Use of the Gibbs Cell by the Canadian Salt Co.

At the meeting of the British Association in Toronto in August, a paper was presented on the above subject by Mr. D. A. Pritchard, Works Manager to the Canadian Salt Co., and Mr. G. E Gollop, Department Superintendent. The paper refers to the Gibbs Cell, the invention of Mr. Arthur E. Gibbs, an English chemist.

THE plant of the Canadian Salt Co. is situated in south-west Ontario within range of the power supply from Niagara, and where there are very extensive salt beds. The salt is extracted in the form of brine. The brine is first treated to remove salts of lime and magnesium, which impurities would otherwise precipitate in the pores of the diaphragm and thereby increase the resistance of the electrolytic cell. This purification is done by heating the raw saturated brine to 85° C. and adding to it a calculated amount of sodium carbonate solution containing a trace of caustic soda. The resulting precipitate of calcium carbonate and magnesia is allowed to settle out and the clear, pure and warm brine run through a settler heated by coils supplied with hot condensed water from the salt grainers. Settling by mechanical clarifiers or in tanks is quite satisfactory and is a considerable saving in labour and material over the filter press methods. The sodium carbonate solution is made by carbonating caustic liquor from the cells with boiler flue gas. This, in addition to being cheaper than using soda ash, gives a more rapid settling precipitate. After the impurities have settled out, the brine is again heated to 85° C. and fed automatically and by gravity to the electrolytic cells, where it is decomposed by the electric current into its component parts.

The Electrolytic Cells

The cells or "electrolytic decomposers" used at the Sandwich Plant are of the diaphragm type and are the invention of an Englishman, Arthur E. Gibbs. The process is undoubtedly one of the most efficient of its kind in operation to-day.

The cell itself is enclosed in an upright iron container cylindrical in shape, and it is assembled by placing inside this container a cylindrical and perforated cathode sheet on the inner side of which is secured a diaphragm of a special grade of long fibre asbestos paper.

Inside the cylindrical cathode and as near to it as practicable are placed 24 graphite sticks, 2 in. by 2 in. by 36 in. long, suspended in a circle from a dome-shaped head. The head, the ring it fits, and the bottom around which the cathode with its diaphragm is formed are made by the company from a mixture of cement and asbestos. The joints between the various divisions of the cell are so designed that they can be made gas tight by a chlorine resistant putty. These cells are arranged in a series of 70 individual cells placed in two parallel rows of 35 each and are connected so that the current must travel in series through the whole 70 under an applied voltage of 250 volts. Each cell will take approximately 3·57 volts and a current of 1,000 amperes. Practically the only departure from the original design has been in the manner of feeding the brine, introduced in the majority of the cells. By this arrangement the cell is kept full of hot brine.

The chlorine gas generated is removed through a pipe connection into a gas main kept under slight suction. The caustic soda together with some undecomposed brine trickles down the outside of the cathode sheet to the bottom of the cell container and thence into a receiving line into storage tanks which supply the evaporator department.

The cell operates at a current efficiency of 93 to 95 per cent. over the anode life of better than a year, a power efficiency of 56–57 per cent., and a voltage efficiency of 60–61 per cent. It will produce, in twenty-four hours per square foot of floor space taken, five pounds of caustic soda and 4·43 pounds of chlorine. The caustic will run 120 g.p.l. NaOH and the chlorine 95 per cent. or better. The cell itself is remarkably simple, while the ease of its assembling and replacement does not demand expensive labour in building or supervising while in operation.

Evaporator Department

The caustic cell liquor is pumped into storage tanks which in turn feed the evaporators. Two double effect Scott evaporators are used with a salt separator for each effect. The problem of evaporating the cell liquor containing 180 g.p.l. salt is no mean one, and requires an equipment with a very rapid liquor circulation to keep a clean heating surface and provide for a rapid heat exchange between the steam and liquor. Then again, inasmuch as the liquors corrode the tubes from which the heating surface is constructed, it is necessary to have an apparatus in which the tubes can be easily replaced. These features it is felt are well provided for in the evaporator made by "Scotts" of London, England, and Fall River, Mass.

In this apparatus the uptake area is distributed over the whole area of the evaporator so that each nest of heating tubes has its own downtake. Although some installations use triple effect evaporation, it is preferred to employ double effect and control the vacuum on each in such a way as to obtain the greatest temperature difference between the steam on the outside of the tubes as compared with the liquor inside the tubes. Operating in this manner is very economical, particularly as exhaust steam from the engines is used for doing the work in No. 1 evaporator.

When a batch is completed, the entire contents of the second effect and its separator is unloaded by a centrifugal pump into a cylindrical drain tank with a conical bottom where it is allowed to settle for forty-eight hours. Separating this cone from the rest of the tank is a finely perforated monel metal screen, and on this screen most of the salt suspended in the strong liquor is retained. This liquor is then drained slowly into cooling tanks which reduce its temperature to 30° C. The solubility of salt (NaCl) in liquor of this strength and at 30° C. is approximately 16 g.p.l. and, since the soluble portion must go to the finishing pots, it is quite important to settle out practically all suspended salt in order to make high test finished caustic. The typical finished liquor shows on analysis:

NaOH	750	g.p.l.
NaCl	17·5	g.p.l.
Na_2SO_4	0·6	g.p.l.
Fe	0·17	g.p.l.

Washing of Salt

The salt left from the strong liquor batch has two washes with 1st effect liquor, one wash with cell liquor or liquor of like strength and then with hot water or brine until the wash water shows but 1 g.p.l. NaOH. A final few minutes wash with hot water removes most of the sodium sulphate that entered the process when the soluble gypsum was removed from the brine. Upon refrigeration of this liquor a saleable Glauber's salt is recovered.

Recovering the Caustic

The clear, settled "strong liquor" is pumped to tanks in the finishing shed and thence into open fire pots 10 ft. in diameter and 7 ft. deep at the centre.

The pots are filled to within 1 ft. of the top and fired briskly until foaming commences. With these liquors this will be about 280° C. Care must be taken from this point until the temperature rises to 360° C. when foaming stops. Up to the time of the initial foaming strong liquor is fed to the pot slowly in order to maintain the original level. After the period of foaming the feed can be run in more rapidly so that the pot is full at the end of the run. The remaining water is boiled out over a period of two and a half days. In this time the pots are brought up to 500° C. and then allowed to cool gradually. At 450° C. coming down, 3 lbs. of sulphur are added to decompose compounds of iron and manganese and then the pot is allowed to settle for twenty-four hours. It is poured at 340° C. with a special centrifugal pump into sheet steel drums for solid or on to iron trays for broken caustic. This supersedes the older method of baling out with large ladle into a pouring trough. A pot of the size given pours sixteen tons of finished caustic. Flake caustic has been largely made during the past two years. This convenient form is produced on an internally water-cooled cylinder which rotates with its face slightly immersed in a shallow pan of molten caustic. The film is picked up on one portion of the cylinder and removed as it rotates past a knife scraper. The operation is continuous.

So far as is known, very little published information is available to describe the reactions involved in the sulphuring of pots, but the following is the explanation as to what occurs, offered by Mr. J. H. Hubel, the company's chief chemist:—

$$6\ NaOH+4S=Na_2S_2O_3+2\ Na_2S+3\ H_2O$$
$$(Na_2S_2O_3+heat=Na_2S+SO_2+O)$$
$$3\ Na_2FeO_4+3\ Na_2S=3\ FeS+6\ Na_2O+3\ O_2$$
$$(Na_2O+H_2O=2\ NaOH)$$
$$2\ FeS+7\ O=Fe_2O_3+2\ SO_2$$

Liquid Chlorine

Since the inception of the alkali-chlorine cell, the disposal of chlorine has been the ever-present problem. The end of the war found the producers with equipment to make more chlorine than the market could possibly absorb, and the price of chlorine both in liquid and bleaching powder dropped to very low levels. At the same time the market for liquid chlorine has expanded to the detriment of bleach sales.

Chlorine derived from the cells is drawn through a cooler and thence through a 40 ft. drying tower counter-current to a flow of strong sulphuric acid to remove the moisture from the gas. The cooler and tower remove at a maximum 50 lb. of water per ton of gas passing through them. This renders possible the liquefaction of the gas in iron equipment, for dry chlorine does not attack iron. Induced from the drying equipment by a Nash pump operating in sulphuric acid, the dry gas is delivered to the towers of the liquefying plant at a pressure above 3 lb. It is there entrained through a suitable suction head with a falling column of strong sulphuric acid contained in a 4 in. line or "leg," as it is called. Falling through a distance of 90 ft. into a compression chamber, the gas pressure is increased thereby to 35 lb. per square inch gauge of 50 lb. absolute, the acid continuing its cycle. Under this pressure the gas rises through double cooling coils kept at −25° C. where it liquefies. The liquid chlorine runs from the cooling coils by gravity through a trap into a steel vessel properly insulated, the capacity of which is some 5,000 lb. From this it is loaded either into storage tanks, 15-ton tank cars or 150 cylinders by air under 100 lb. pressure which is previously dried by passing through a series of towers containing strong sulphuric acid.

Chlorine gas as it leaves the cell room shows on analysis 95 per cent. Cl_2, 1·2 per cent. CO_2, 1 per cent. H_2, a trace of CO and the balance air.

Sir Max Muspratt's Comment

The above paper was presented at the meeting of the British Association in Toronto, and Sir Max Muspratt, Chairman of the United Alkali Co., being present, was asked to comment upon it, and he dealt with the romantic side of the introduction of the Gibbs cell into England. After a very careful survey of the field, the Gibbs process was selected over others, particularly the mercury cells, on account of the very reasonable royalty asked by Mr. Gibbs, the smaller capital outlay required, coupled with the proved working efficiency of the process already operating in the United States and Canada. Mr. A. Drake, son of Mr. B. Drake, of Drake and Gorham's, Ltd., and a descendant of the famous Drake of history, was sent to Detroit, U.S.A., and Windsor, Canada, in 1913 to learn the process. Equipped with complete working plans, he sailed on the ill-fated *Lusitania*. His loss was a serious embarrassment to the Empire at a time when industry was straining every nerve to meet the demands of war. Fortunately, Mr. Pritchard, in the employ of the same company, was available. He was sent over, and work was soon started. "In all my experience," said Sir Max Muspratt, "I have never seen a process installed with such despatch, the equipment put in and production started without a hitch. This was in a large measure due to Mr. Pritchard's untiring energy, and the Empire owes him a debt of gratitude for so speedily carrying the work to its conclusion and so successfully operating the plant during the time when every pound of product was so sorely needed."

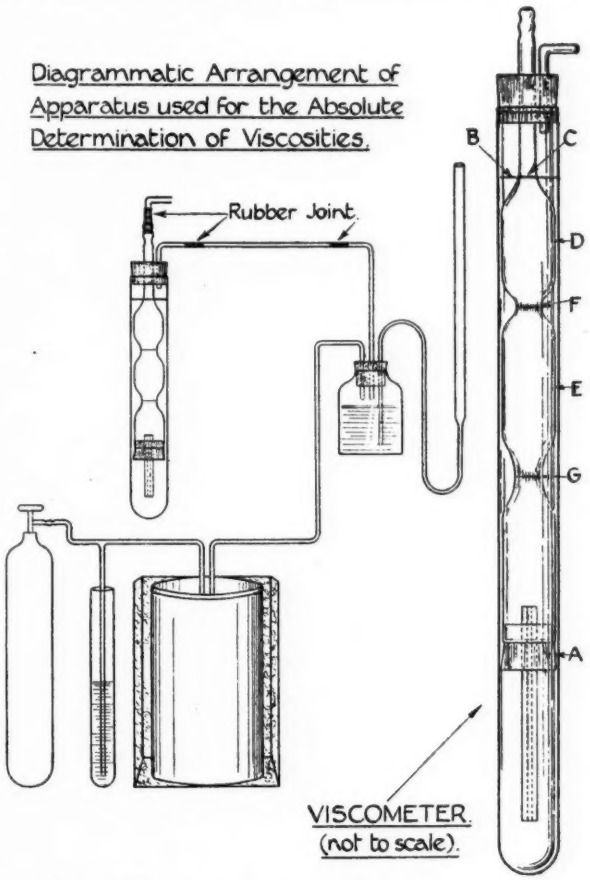
Oil and Colour Chemists' Opening Meeting

THE first meeting of the session of the Oil and Colour Chemists' Association will be held on Thursday next, October 9, at the offices of the National Federation of Paint and Varnish Manufacturers, 8, St. Martin's Place, London, W.C., when the president, Dr. H. H. Morgan, will deliver his presidential address on "The Preparation and Value of Paint and Varnish Specifications."

Determination of Viscosities

Redetermination of Figures for Castor Oil

A REPORT issued by the Aeronautical Research Committee and published by H.M. Stationery Office (price 1s.) deals with the measurement of viscosity by means of capillary tubes. The work was carried out by Dr. Guy Barr, B.A., D.Sc. A set of four oils whose viscosities at 25° C. range from 0·14 to 6·5 poises and a series of Ostwald viscometers covering a larger range have been standardised. Absolute determinations were made on three of the oils using capillaries of 1·5 mm. bore, and the constant for a certain Ostwald instrument deduced (*a*) from these viscosities; (*b*) by a step-wise calibration starting from water; and (*c*) by calibration with sugar solution. The results agreed within 0·3 per cent. The



corrections required in the use of each of these methods are fully discussed in the report.

The viscosity at 40° C. of a sample of castor oil for which Redwood times varying by 8 per cent. were found by various members of a panel of one of the B.E.S.A. Sub-committees was determined on the above calibrated instrument and found to be 5 per cent. lower than results from the application of Higgins's formula to the times observed with his Redwood viscometer. It is suggested that the constant 0·00260 of Higgins's formula is too high for his instrument and that the constant is not the same for different viscometers of the Redwood pattern. The confirmation of Higgins's value recently reported by the Bureau of Standards is thus probably accidental. A much more rigorous specification is therefore necessary if concordance is to be secured between different instruments of this type.

The value deduced for the viscosity of the castor oil sample was also confirmed by measuring the time of fall of a steel ball in a more viscous liquid and comparing the time of flow of this liquid with that of the castor oil in an Ostwald viscometer.

The illustration shows the apparatus standardised for carrying out the above tests.

German Chemical Industry Conditions

THE Board of Trade has received a report on the state of trade and industry in Germany during August. The report states that the position of the potash industry continued to improve. Sales increased and reached about four-fifths of normal. Foreign sales (in one large works these amount to 60 per cent. of the total sales) were in various cases interfered with owing to difficulties in regard to freight room on waterways in consequence of inadequate coal supplies from Westphalia. The improved situation is probably due to the increase in prices of agricultural products, to the agreements between the German and Alsatian potash industry as to American sales, and to the large credit offered by America to the Potash Syndicate for deliveries which are not to be effected until later. As a result of Alsatian competition sale prices are considerably below the pre-war level.

The chemical industry in the west of Germany still suffered from the increase in the costs of production owing to the M.I.C.U.M. burdens, customs duties and heavy taxes. In consequence of the general shortage of money there is no demand on the inland market, while it is difficult for German products to compete in foreign countries owing to the preliminary burdens to which they are subject. In the Central German chemical industry the position has become worse. This applies specially to the dye industry, in which foreign sales have declined in consequence of the Japanese import restrictions. The production of fertilizers was normal. Gorlitz reports that the chemical preparations industry is faced with further restrictions of work.

The position in the sheet glass industry has become worse and production has been restricted.

Pulverised Fuel Plant for Belfast Flax Mill

THE Vickers and International Combustion Engineering, Ltd., have just closed another important contract for the power plant of a large flax mill in Belfast, owned by the York Street Flax Spinning Co., Ltd. The contract is for the complete design and erection of all buildings, coal handling plant, boilers and furnaces, burners, etc. The boilers are of B and W type, each having 9,270 sq. ft. heating surface, and the pulverising plant is that known by the now familiar trade name "Lopulco," the pulverisers being of Raymond five-roller type. The directors of Vickers and International Combustion Engineering, Ltd., wish it to be known that the company has been specially organised to undertake all the w rk of power plants from foundation to roof and from coal bunkers to switchboard. Negotiations are just being closed whereby this company will receive written confirmation of two orders which aggregate £270,000.

Research in South Africa

THE *Journal* of the South African Chemical Institute for July, which has been received from Johannesburg, contains a number of technical papers on varied topics ranging from methods of steel analysis to a determination of the seasonal variation of nitrates in the Black Turf at Onderstepoort. Other papers deal with experimental work on torbanite from the Transvaal, which was found capable of producing a useful range of light and heavy oils. There is also an investigation of the influence of the admixture of different grades of limestone on the solubility of phosphoric oxide in superphosphate, which is a matter of considerable importance in South Africa where the deficiency of phosphates in the soil has to be made up by artificial means.

A Volume of Photographic Research

THE Research Laboratory of the Eastman Kodak Co., of Rochester, New York, is to be congratulated on the publication of another volume (the seventh) of "Abridged Scientific Publications." The work covers mainly the chemistry and physics of the photographic emulsion in a variety of aspects. The crystalline structure of the silver halides, theories of exposure of various kinds (including a quantum theory), the chemistry of the acid fixing bath, and many other matters of photographic value form a representative selection of the contents of the publication, and give some idea of the nature of the research carried out by this concern.

Japanese Dyestuffs Progress

THE Tokyo letter in *Industrial and Engineering Chemistry* observes that since the Great War the dyestuff industry of Japan has made great progress. About twenty important dyes of good quality are being supplied by the domestic dye companies. Japan therefore needs to import only about 2,500,000 lb. of special dyes from foreign countries. Europe was a central market for the dyes, but now the balance is changed. The Oriental market is being disturbed by the dumping of the foreign dyes. Therefore, the Japanese Government has wisely taken the policy of protecting her dye industry. An ordinance was issued from the Agricultural and Commercial Department requiring merchants who wish to import coal-tar dyes and chemicals derived from fractionally distilled compounds from coal-tar, except medicines and phenol, to get permission from the Minister of the department. The substances limited are as follows :—Artificial musk, salicylic acid, saccharin, chemical compounds derived from fractionally distilled compounds from coal-tar, among which are perfumes, with the exception of benzaldehyde, nitrobenzene and nitrotoluene, phenol, salicylic acid, Bakelite, and medicines ; β-naphthol, methyl and ethyl ethers, cinnamic acid, benzyl and salicylic esters, etc. ; artificial indigo, and other coal-tar dyes.

Chemical Sprays

USERS of sprays in sulphuric acid manufacture or other chemical work should examine the catalogue of "Monarch" chemical sprays, supplied by Mr. H. T. Watson, chemical engineer, of 46, Fairfield Road, Widnes, who is the sole agent for these products in this country. "Monarch" sprays are widely used in the United States, and reference to the catalogue shows that a wide variety of sizes are available and a number of different materials are used, such as lead, brass, stoneware and hard rubber. The parts of many types are interchangeable, making for economy of operation. Sulphuric acid plant is specially catered for by stoneware water-sprays, which are claimed to increase efficiency compared with steam sprays, especially in hot weather. These sprays work equally well in any position, spraying upward, downward or sideways and at pressures of 30 to 80 lb. at the nozzle. Other sprays included in the catalogue are for spraying oil into gases, for humidifying or moistening and for milk powdering.

Chemical Manufacturer's Failure

SEVEN motions in reference to the bankruptcy of Bertram Levin, chemical manufacturer, formerly of 16, Deansgate, Manchester, were down for hearing at the Manchester County Court on Monday. During the sitting of the court the parties, who had previously arrived at an understanding, consulted, and Mr. Singleton (for the trustee) afterwards said they had now accepted a signed agreement.

The position, as we are informed, is that all the motions were settled on terms endorsed on counsels' briefs. Shortly, the Judge was informed that certain of the motions were withdrawn, that in certain others the respondents consented to orders in favour of the trustee, and that in one an order by consent was made in favour of the Semolina Company, Ltd.

Judge Mellor indicated his approval of the settlement and made an order as to costs in which the trustee was indemnified.

Separation by Super-Centrifuge

THE impression remaining after examining the latest "Sharples" literature is that there is practically no separation job which the Sharples Super-Centrifuge cannot handle. Though, of course, the instrument has its limitations, the range of uses is very wide, covering the clarification, dehydration, purification of liquids, the separation of two liquids or the solids from a liquid, and so on. It overlaps the field of the filter to a certain extent, being particularly suitable for dealing with gummy materials which are likely to clog filters. The various uses are well set out, with illustrations of many actual installations, in the latest catalogue produced by the firm, Super Centrifugal Engineers, Ltd., Imperial House, Kingsway, London, W.C.2. Another leaflet draws attention to the fact that the machines render available a force 16,000 times greater than gravity.

From Week to Week

The Delegacy of King's College, London University, have appointed Mr. G. A. Edwards, B.A. (Oxon), demonstrator in chemistry.

Sir William Jones, chairman of the Research Committee of the British Refractories Association, is now on a visit to the United States.

While lowering a five-ton brine tank at the new salt works of Mr. John Sheffield, at Sandbach, a labourer was killed by the tank falling on him.

Freehold chemical works and plant belonging to the West Riding Chemical Co., Steannard Lane, Mirfield, are to be sold by auction shortly.

A chemical fire extinguisher in a few minutes almost completely extinguished a blazing 3-ton lorry in Bow Lane, Cheapside, London, on Friday, September 26.

A boilermaker was killed at Peterhead on Saturday. He was repairing a vitriol tank from the local gasworks with an acetylene welding plant when an explosion occurred.

On the completion of sixty years' service with Wood Brothers Glass Company, Ltd., Mr. Thomas Gambling, of Barnsley, has received a presentation from the staff. For 30 years he has been works manager.

The Sunlight Enamel and Paint Co., Ltd., announce that they have changed their address to 31–32, Grosvenor Place, London, S.W.1, to which all communications should now be sent. The telephone number is "Victoria, 6302–5."

Mr. A. D. Daysh, of the Graesser-Monsanto Chemical Co., London, was present at the recent sales convention of the Monsanto Chemical Works, held at St. Louis, U.S.A., and gave an account of business methods in England and on the Continent.

James Gordon and Co., Ltd., of Windsor House, Kingsway, London, advise us that they have recently opened a branch office at 110, Waterloo Street, Glasgow, under the management of Mr. A. D. Burgess. The firm specialises in instruments and appliances for boilers.

Reports from Russia state that a private company, the Russian Oil Products, Ltd., has been registered and granted the right to operate in Russian territory. The company was formed by Arcos and the Russian Naphtha Syndicate to sell naphtha products in Britain.

Mr. Edward Hilton Brown, of London, a chemist associated with the British firm of McGuire, Patterson, Palmer and Co., match manufacturers, has just died at Toronto after a brief illness. For two years he was in charge of the company's branch at Pembroke, Ontario.

Professor Heilbron, referring to Professor Baly's recent announcement of the production of synthetic glucose, said that though this was a matter of scientific rather than commercial interest, no one with any imagination would think the discovery the less to be admired on that account.

Pharmaceutical preparations of United States origin will in future obtain a 25 per cent. rebate in import duties into Nicaragua, under an agreement recently reached between the two countries. Arrangement has also been made for the free entry of raw materials for manufacturing soap.

The Union of German Dye Works has made a contract with a German-Russian trading company to sell tar dyestuffs to the extent of at least two million kilograms a year and valued at thirty million Swiss francs in Russia, according to reports from Berlin. The dyestuffs are to be consigned on credit.

Sodium Nitrate, whether imported crude or refined, is entitled to admission to the United States free of duty under Paragraph 1667 of the Tariff Act, according to recent official ruling. The ruling denies the petition of domestic producers, who requested that refined sodium nitrate be classified at 25 per cent. *ad valorem*, under Paragraph 5 of the Act.

The death is announced of Dr. Henry Kraemer, at Detroit. He had spent twenty years of service at the Philadelphia College of Pharmacy, was editor of the *American Journal of Pharmacy* from 1898 to 1917, and had been a member of the Revision Committee of the U.S. Pharmacopœia since 1900. Dr. Kraemer was a member of many pharmaceutical and scientific societies.

Sir Arthur Duckham, president of the Institution of Chemical Engineering, has addressed an invitation to the American Institute of Chemical Engineers to hold a joint meeting in England in July, 1925. The secretary of the American Institute is now inquiring among the members as to whether a sufficient number would attend to make a joint session in England a success.

At the Birmingham Quarter Sessions on Saturday last, William Jordan, Oliver Hickman, and Richard Westney, were charged with breaking into the factory of Southall Brothers and Barclay, Ltd., manufacturing chemists, of Alum Rock Road. Hickman and Jordan, both of whom have been previously convicted, were sentenced to three and four years penal servitude, respectively. Westney was found not guilty.

In future, containers of dyes imported into America must contain a true and accurate description of the contents, without exception. In the past certain exceptions have been made in special circumstances, whereby it was possible to enter certain dyes, especially aniline colours, without the containers being marked, the marking being done in bonded warehouses in the United States and before being withdrawn for distribution.

Mr. James Picken, B.Sc., A.I.C., has been appointed an Inspector under the Alkali, etc., Works Regulation Act, 1906, succeeding the late Mr. H. Bailey. Mr. Picken, who took his degree at Glasgow University, is a medallist in chemistry, and has had considerable experience in the gas industry. He was connected with the Oldbury munition works, as chemist in charge of acid plant, and with Glasgow Corporation Gas Department. During the war Mr. Picken served in France with the Artillery.

The London office staff of Vickers and International Combustion Engineering, Ltd., had the first annual dinner at the Connaught Rooms, on September 23. Mr. G. C. Usher, the general manager, presided, supported by Mr. G. R. T. Taylor (of Taylor Bros., Ltd.), who is managing director. Although the company only started operations in Great Britain in January, the staff of the London office already numbers sixty-five, and in addition there is an extensive personnel at the works in Barrow-in-Furness.

At the University Court of St. Andrews on September 29, Dr. O. R. Howell, B.Sc., Ph.D., Pembrokeshire, was appointed lecturer in chemistry in University College, Dundee, in place of Dr. J. S. W. Boyle, Ph.D., lately appointed headmaster at Prestonpans. The following nominations of assistants were approved, viz.: Chemistry, Dundee—Mr. C. A. Kerr, B.Sc. Chemistry, St. Andrews—Mr. George J. Robertson, M.A., B.Sc. Laboratory assistant, chemistry, St. Andrews—Mr. William G. Reid, B.Sc.

The U.S.A. Treasury Department has refused to issue an anti-dumping order against the importation of sodium nitrite and has refused to find as a fact that there has been dumping of sodium nitrite imported from Norway and Germany. Petitions for application of the anti-dumping law to imported sodium nitrite were filed with the Treasury last August by a Seattle company which applied to the Tariff Commission for an increased rate of duty. Later, on recommendation from the Commission, the rate of duty was advanced by 50 per cent.

Sir Max Muspratt, speaking at a meeting of the American Chemical Society, said that chemistry had made possible for the many what had been formerly the luxuries of the few. He stated that it had stimulated food production, the textile industries, iron and steel industries, metal and alloy production and even extended its services to disease prevention. Sir Max has expressed the opinion that business in the United States and England is suffering from too great expectations. People expect too much in the way of profits and wages and luxuries of life, and they are discontented, exasperated, rebellious and even riotous, because they do not get it.

The Secretary for Mines announces that he has appointed Mr. F. N. Siddall, H.M. Junior Inspector of Mines, to be a member of the Committee on Mechanical Appliances, in the place of Mr. C. D. Mottram, retired. Mr. A. D. Stedman, of the Mines Department, has been appointed to act as secretary to the committee, and communications should be addressed to him at the Mines Department, Dean Stanley Street, Millbank, Westminster, London, S.W.1. Mr. E. Shinwell has also appointed Mr. Siddall to be secretary to the committee set up to inquire into the methods now adopted to prevent danger in mines from accumulation of water or other liquid matter, in the place of Mr. T. L. McBride, who has been promoted.

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220,985. PHENOLIC CONDENSATION PRODUCTS, MANUFACTURE OF. H. Wade, London. From S. Karpen and Bros., 678, West 22nd Street, Chicago, Ill., U.S.A. Application date, May 24, 1923.

An aldehyde dichloride is condensed with a phenolic body in the proportion of 4·5 phenolic groups to each methylene group, in the presence of ammonia. These aldehyde dichlorides are obtained as by-products when natural gas is subjected to chlorination to obtain methyl chloride. The three members of the series, methylene chloride, ethylidene chloride, and propylidene chloride all react with phenol or cresols, but with increasing slowness. The condensation takes place more rapidly when ammonia is present in an amount sufficient to combine with the chlorine. The resin forms as a viscous lower layer, the upper layer consisting of ammonium chloride, which crystallises on cooling. The resulting resin is washed, and the excess of phenol may be boiled off to obtain a hard and brittle resin which is fusible and soluble in aqueous alkali, alcohol, acetone, ether, etc. A softer resin is obtained if the phenol is left in it. The process is preferably carried out in an autoclave, which is heated to 180° C. for about 30 minutes, but the condensation may be effected at a temperature of 100° C. in 12–24 hours. The ammonium chloride may be reconverted into ammonia for use again. The resin may be rendered infusible and insoluble by treating with hexamethylene tetramine, formaldehyde, or formaldehyde and ammonia. Phenol, cresols and naphthols may be condensed in a similar manner, and other suitable compounds of ammonia such as methyl amine or ammonium carbonate may be used in place of ammonia.

221,000. METALLIC CATALYSTS USED IN THE HYDROGENATION OF OILS AND LIKE SUBSTANCES, PROCESS FOR THE PREPARATION AND REACTIVATION OF. Technical Research Works, Ltd., and E. J. Lush, 4, Milner Street, London, S.W.3. Application date, May 31, 1923.

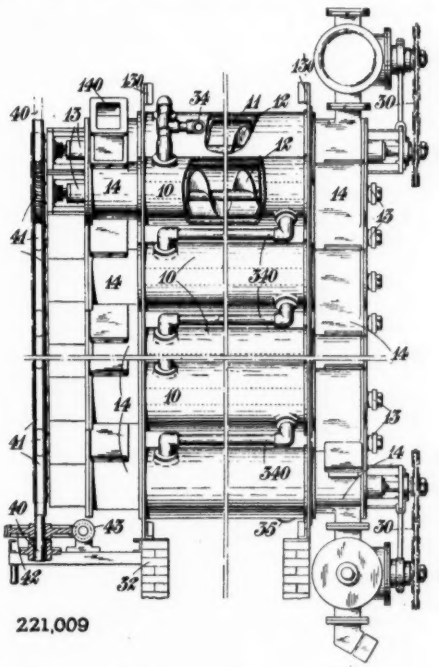
The object is to reactivate a catalyst such as that described in Specification No. 203,218 (See THE CHEMICAL AGE, Vol. IX., p. 377) without removing it from the hydrogenation vessel. The nickel turnings are freed from oil or other organic material by extracting with a solvent, and are then treated with hypochlorous acid. An oxidised surface is thus formed on the metal, which is then washed with water and reduced in hydrogen at 250°–350° C. To prevent discoloration of the hydrogenated oil, which would occur if an iron vessel were used and the catalyst reactivated in it, the vessel may be made of or lined with nickel or copper, or glass or enamel. The process is also applicable to the reactivation of a catalyst of metallic powder deposited on materials such as kieselguhr.

221,008. PERYLENE-TETRA-CARBOXYLIC ACIDS OR THEIR MONOIMIDES, PROCESS OF PRODUCING. S. Sokal, London. From Kalle and Co., Akt.-Ges., 23, Rhein-Strasse, Biebrich-on-Rhine, Germany. Application date, June 1, 1923.

The colours which are obtained by melting the imide of naphthalene 1:8-di-carboxylic acid or its halogenated derivatives with alkaline agents and oxidising if necessary are treated with strong sulphuric acid at a high temperature. If the temperature is 180°–190° C. the monoimides of the perylene-3:4:9:10-tetracarboxylic acids are obtained. If the temperature is 210°—240° C., the perylene tetracarboxylic acids themselves are obtained. In an example, naphthalene 1:8-dicarboxylic acid imide is melted with caustic potash and heated with sulphuric acid of 60° Bé. to about 180° C. to obtain the monoimide of the perylene tetracarboxylic acid, mixed with the anhydride of perylene tetracarboxylic acid. The sodium salts of these acids have different solubilities and this fact is used to separate them. The monoimide gives a red solution in dilute alkali, and a bluish-red solution in strong sulphuric acid. The acid which is obtained by heating with concentrated sulphuric acid to a higher temperature is brown, and dissolves in alkalies to a brownish-yellow solution. The acid forms vat dyestuffs with amines.

221,009. DESTRUCTIVE-DISTILLATION APPARATUS. F. Lamplough, Highfield, Feltham, Middlesex. Application date, June 1, 1923.

This apparatus is particularly suitable for the distillation of shale and solid carbonaceous fuels. Two rows of horizontal jacketed retorts 10 and 11 are staggered in respect to one another, and each retort is provided with a screw conveyor 12 having bearings 13 arranged in boxes 14 at the ends of the retorts. These boxes are connected by conduits, so that a retort in one row is connected to a retort next below it in the other row, the connections being made alternately from opposite ends of the retorts. The material to be treated thus passes through all the retorts in series, and the inclined conduits connecting the boxes ensure a smoother travel than would be obtained with vertical conduits. The screw conveyors may be alternately left and right-handed, so that they may all be driven by the same gearing 40, 41, in the same direction. The worm spindle 40 carries a number of worms alternately right and left-handed, so that the worm wheels on



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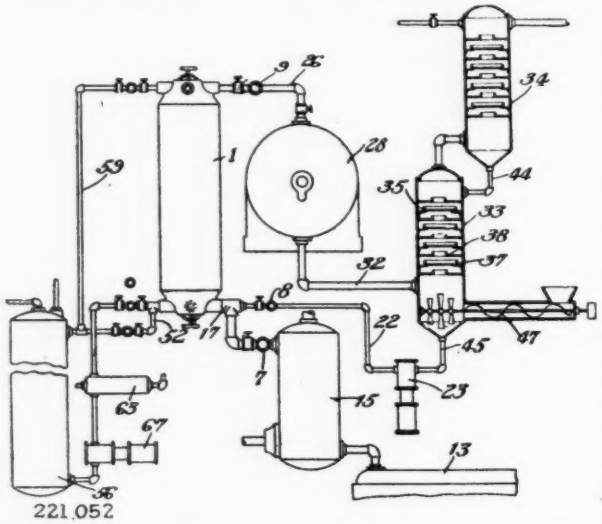
each side of it are all driven in the same direction. The end thrust on the worm spindle is thus balanced. Superheated steam is passed through the pipe 34 to the jackets of the uppermost retorts, and then downwards through the remaining jackets by pipes 340, the temperatures in the lowest jackets being 300°–400° C. The highly superheated steam then passes into the lowest retort and then upwards through the remaining retorts to carry off the oil vapour. The heat from the furnace is uniformly distributed through the retorts by means of the steam jackets.

221,052. CARBONACEOUS MATERIALS, PROCESSES OF TREATING. M. J. Trumble, 816, Higgins Building, Los Angeles, Cal., U.S.A. Application date, July 12, 1923.

The process is for distilling shale, peat, coal, lignite, etc., to obtain gasolene and coke. Additional hydrocarbons may be injected into the coke to improve its quality. A series of six retorts 1 are supplied with saturated steam which passes from a boiler 13 to a superheater 15, and thence to a steam main 7 serving all the retorts. The temperature of superheat may be 800° C. A heavy hydrocarbon liquid containing a finely pulverised solid may also be supplied from a similar main 8. The vapour passes from the retorts through a common main 9, and then through a pipe 26 to a turbo-electric generator 28. The exhaust steam and vapour from the latter pass through a pipe 32 to a fractionating apparatus comprising dephlegmators 33, 34, each containing annular and central pans, 38, 35. A heavy hydrocarbon liquid may also be admitted to the top of the dephlegmator 34, and any liquid which collects in the dephlegmator 33 passes through a pipe 45

to a pump 23. Pulverised solid fuel may also be supplied by a conveyor 47 to mix with this heavy oil, and the mixture is supplied to the bottom of the retorts as previously mentioned. Each retort is connected by a pipe 52 with an oil storage tank 56, which is also connected with the space at the top of the retorts through a pipe 59. Oil may be fed from the tank 56 through a pump 67 and heater 63 to the bottom of the retorts.



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Each retort passes through a definite cycle. It is first charged with carbonaceous material, and hot oil is supplied from a tank 56 to dry the material, the oil then returning to the tank 56. Steam and oil vapour are then supplied from the adjacent retort to the bottom of the retort 1, and during this time the adjacent retort on the other side is being cleared of coke and recharged. The material is distilled until coke remains, and the hydrocarbon and solid fuel mixture is then supplied from the pump 23 and the hydrocarbon is cracked. The coke may thus be converted into a metallurgical coke. Steam is again passed through the retort to crack and drive off any remaining volatile matter. Each retort passes through the above cycle in turn.

221,102. Electrolysis of Water, Apparatus for. L. Casale, 9, Via del Parlamento, Rome. Application date, October 10, 1923.

In the electrolysis of water by means of alternate positive and negative electrodes of iron in an electrolyte of caustic

Fig. 1.

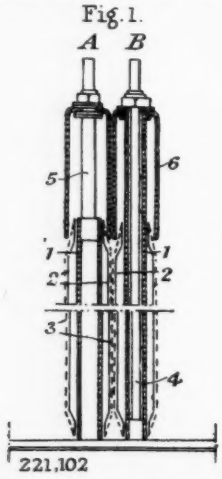
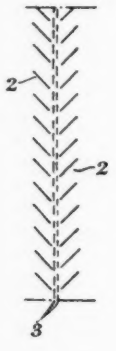


Fig. 4.



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soda, it is necessary that the difference of potential of any two opposite parts of adjacent electrodes should be constant, and that the conductivity of the electrolytes should also be constant. In this invention, the electrodes A, B consist of tubes 1 attached to plates 2. The plates consist of inclined slats or louvres arranged horizontally, so that the gases liberated on their active surfaces are guided to the interior of the electrode. The adjacent electrodes are separated, and mixture of the oxygen and hydrogen is prevented, by means of porous diaphragms 3, while conductors 4, 5 pass downwards through the tubes 1 to which they are connected at the bottom and top alternately. The gases are collected by means of inverted receivers 6 of insulating material. With this apparatus the active surfaces opposite to one another are free from polarisation and the resistance of the electrolyte is a minimum, so that the consumption of current is reduced. The potential difference between any two opposite points on adjacent electrodes remains constant.

221,109. Settling or Precipitation Tanks. S. Hunter, Newlyn, Penzance. Application date, October 27, 1923.

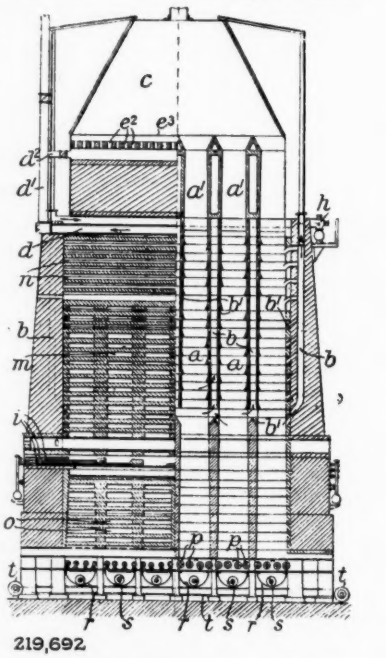
A settling tank is made in the shape of an inverted cone having a discharge outlet for sludge or precipitate at the bottom. The outlet is controlled by a valve in the shape of two cones joined at their bases. If this valve is raised after the settling of the precipitate, the shape of the valve ensures the breaking up of the precipitate near the outlet, and the solid material is readily discharged.

Note.—Abstracts of the following specifications, which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention: —199,017 (J. Koritschoner and F. Hansgirg), relating to the manufacture of pure alumina, see Vol. IX, p. 180; 201,531 (J. H. van de Meulen), relating to a process of vulcanising oils and fats, see Vol. IX, p. 350; 201,906 (F. Pollak), relating to condensation products from formaldehyde and urea, thio-urea, or their derivatives, see Vol. IX., p. 378; 206,831 (Farbwerke vorm. Meister, Lucius and Brüning), relating to acid azo dyestuffs, see Vol. X., p. 73; 210,734 (Metallbank und Metallurgische Ges.), relating to furnaces for burning sulphur, see Vol. X., p. 390.

International Specifications not yet Accepted

219,692. Retort Furnaces. J. Pieters, 74, Rue St. Lazare, Paris. International Convention date, July 23, 1923.

These retorts for distilling lignite, peat, or sawdust having considerable moisture are arranged in series in two directions at right angles in a single setting. The retorts *a* are separated by flues *b*, having aperatures b^1 into which the distillation gases pass, all the flues discharging into a main *h*. The raw material in the hopper *c* is supported on a perforated floor, the perforations e^2 being covered by hoods e^3. The retorts are heated by burners *i*, and the hot gases pass through channels *m*, *n*, in the structure between the retorts, and thence to the passage *d*. The hot gases then pass through conduits d^1, d^2, and then upwards through the raw material to dry it. The temperature in the upper part of the retorts is 400°- 500° C., and is higher in the lower part. The coke may be cooled in the lowest part of the retorts by means of steam circulating in channels *o*, and superheated steam may also be injected to generate water gas and cool the coke. The coke is discharged by rollers *p* and conveyors *s*.



219,692

219,699. Phenols. Zeche M. Stinnes, 1A, Beisingstrasse, Essen, Germany. International Convention date, July 27, 1923.

Low-temperature coal tar is distilled at ordinary pressure, and the fraction which distils at 220°–300° C. is collected, and

the high-boiling phenols separated from the neutral oils. A further fractionation may be employed before the separation. The products are used as disinfectants.

219,922. ALKYL AND ACYL RESORCINOLS. Sharp and Dohme, Inc., Baltimore, Md., U.S.A. (Assignees of A. R. L. Dohme, 307, West Pratt Street, Baltimore, Md., U.S.A.) International Convention date, July 31, 1923.

Resorcinol is heated with a fatty acid containing more than two atoms and a condensing agent such as zinc chloride, to obtain acyl resorcinols. These are purified by vacuum distillation and reduced by zinc amalgam and hydrochloric acid to obtain alkyl resorcinols, other than methyl and ethyl. These products are non-toxic antiseptics or germicides. Examples are given of the production of *n*-propyl, isobutyl, *n*- and isoamyl, and *n*-hexyl resorcinols.

219,926. CELLULOSE ESTERS. Soc. de Stéarinerie et Savonnerie de Lyon, 56, Chemin de Gerland, Lyons, France. International Convention date, July 31, 1923.

Cellulose esters containing higher fatty acid radicals and nitric acid, or other organic acid radicals, are obtained by treating esters containing the latter groups with the acid chlorides of the higher fatty acids, in the presence of pyridine and benzene. The ester is precipitated with alcohol, dissolved in benzene, and reprecipitated with alcohol.

219,971. ALKALI CARBONATES AND HYDRATES. A. F. Meyerhofer, 10, Goethestrasse, Zürich, Switzerland. (Assignees of E. De Häen Akt.-Ges., Seelze, near Hanover, Germany). International Convention date, August 2, 1923.

A solution of alkali fluoride is mixed with an alkaline earth carbonate or hydroxide, yielding the alkali carbonate or hydrate, and alkaline earth fluoride. The latter is treated with hydrochloric acid, and then with sodium chloride and silicon fluoride to obtain alkali silicofluoride. This is heated to obtain alkali fluoride and silicon fluoride, which are used again.

219,983. SEPARATING HAFNIUM AND ZIRCONIUM. Naamlooze Vennostschap Philips' Gloeilampenfabrieken, 6, Emmasingel Eindhoven, Holland. (Assignees of D. Coster, 24, Marnixstraat, Haarlem, Holland, and G. von Hevesy, 15, Lille Strandvej, Hellerup, Copenhagen.) International Convention date, July 30, 1923.

Mixed zirconium and hafnium oxychlorides are dissolved in alcohol, and precipitated with ether or acetone. The precipitate contains a higher proportion of zirconium oxychloride than the original mixture. Alternatively, the original mixture may be dissolved in alcohol and ether, and precipitated with water, the precipitate containing a higher proportion of zirconium. The separation may also be effected by fractional crystallisation or precipitation of other higher basic compounds.

LATEST NOTIFICATIONS.

222,093. Process of purifying oils and fats in vacuo by means of steam or the like. Metallbank und Metallurgische Ges. Akt.-Ges., and Gensecke, Dr. W. September 18, 1923.

222,094. Manufacture of vat dyestuffs containing sulphur. Farbwerke vorm. Meister Lucius and Brüning. September 17, 1923.

222,101. Process for preparing an adsorption compound from paraffin hydrocarbons and cereal flour. Chemische Fabriks vorm. Sandoz. September 20, 1923.

222,110. Process for the manufacture of magnesium salts. A. Nihoul. September 19, 1923.

222,120. Manufacture of vat dyestuffs containing sulphur. Farbwerke vorm. Meister Lucius and Brüning. September 19, 1923.

222,122. Manufacture of an iron cement. E. Martin. September 17, 1923.

222,125. Manufacture of condensation products of the anthraquinone series. Farbwerke vorm. Meister, Lucius and Brüning. September 18, 1923.

222,136. Process of preparing benzyl resorcinol. Hirzel, H. September 19, 1923.

222,137. Synthetic ammonia process. Synthetic Ammonia and Nitrates, Ltd. September 19, 1923.

222,141. Process for the production of terpene alcohols. G. Austerweil. September 19, 1923.

222,147. Method of producing nitrogen-hydrogen mixture for the synthetic production of ammonia. Synthetic Ammonia and Nitrates, Ltd. September 21, 1923.

Specifications Accepted, with Date of Application

202,975. Aromatic sulphonic acids, Production of. Rheinische Kampfer Fabrik Ges. August 23, 1922.

221,528. Dehydration and distillation of tars or oils. Thermal Industrial and Chemical (T.I.C.) Research Co., Ltd., and D. Rider. April 10, 1923.

221,529. Titanium steel, Production of. W. Mathesius and H. Mathesius. April 11, 1923.

221,548. Disruptive forces in films of liquid or suspensions of substances in liquids confined between closely adjacent surfaces rotating relatively to one another at high speeds, Method of and means for producing. Burt, Boulton and Haywood, Ltd., and F. J. E. China. June 6, 1923.

221,553. Synthetic gum, Manufacture and production of. J. Y. Johnson. (*Diamond State Fibre Co.*). June 9, 1923.

221,559. Cracking or decomposition of materials containing or yielding hydrocarbons. M. Melamid. June 12, 1923.

221,565. Arsenical therapeutic preparations, Manufacture of. S. R. MacEwen. June 13, 1923.

221,622. Carburetted water gas, Manufacture of. Humphreys and Glasgow, Ltd. (*O. B. Evans, J. A. Perry, and L. B. Eichengreen.*) August 3, 1923.

221,643. Halogenated vat colouring matters, Manufacture and production of. J. Y. Johnson. (*Badische Anilin and Soda Fabrik.*) September 18, 1923.

221,679. Carbonisation of solid fuels, Retorts for. A. L. J. Queneau. October 31, 1923.

Applications for Patents

Acelta Capping Co., Ltd. Apparatus for capping bottles. 22,718. September 26.

Baddiley, J., British Dyestuffs Corporation, Ltd., Horsfall, R. S., Jackson, H., and Shepherdson, A. Manufacture of colour lakes. 22,484. September 23.

Badische Anilin-and Soda-Fabrik, and Johnson, J. Y. Manufacture of organic compounds. 22,557. September 24.

Blackshaw, H., and Lawrie, L. G. Mordanting, dyeing, etc., cellulose-acetate materials. 22,485. September 23.

British Celanese, Ltd., and Ellis, G. H. Treatment of cellulose derivatives. 22,423. September 23.

British Oil Products Co., Ltd. Treatment of paints, etc. 22,512. September 24.

Caspari, F. Low-temperature distillation of fuels. 22,564. September 24. (Germany, September 27, 1923.)

Catlin Shale Products Co., and Marks, E. C. R. Distillation of carbonaceous material. 22,348. September 22.

Coles, S. O. Cowper-. Electro-deposition of metals. 22,405. September 23.

Damm, P., and Russig, F. Process for purifying crude naphthalene. 22,477. September 23.

Dempster and Sons, Ltd., R., Illingworth Carbonisation Co., Ltd., Illingworth, S. R., and Toogood, H. J. Apparatus for carbonisation of fuel. 22,705 and 22,706. September 25.

Deutsche Gasglühlicht-Auerges. Manufacture of pure zirconium. 22,590. September 24. (Germany, September 25, 1923.)

Dreyfus, H. Manufacture of cellulosic products. 22,697. September 25.

Du Pont de Nemours and Co., E. I. Alloys. 2,579. September 24.

Fairbrother, H., and Jackson Research Corporation. Process of distilling shale. 22,445. September 23.

Farbwerke vorm. Meister Lucius and Brüning. Manufacture of tanning substances. 22,465. September 23.

Harrison, W., and Lustrafil, Ltd. Manufacture of artificial silk. 22,277. September 22.

Hefti, F. Manufacture of esters. 22,380. September 23. (October 31, 1923.)

Hermann, J., and Perkin, F. M. Distillation and carbonisation of carbonaceous materials. 22,470. September 23.

Heyl, G. E. Mineral pigments. 22,747. September 26.

Hooper, L. D. Production of cyanides, cyanamides, ammonia, etc. 22,407. September 23.

Humphrey, H. A., and Synthetic Ammonia and Nitrates, Ltd. Ammonia synthesis. 22,594. September 24.

Moreschi, A., and Soc. Anon. Aloformia. Manufacture of iodine and bromine from natural waters, etc. 22,493. September 23.

Riedel Akt.-Ges., J. D. Process for splitting fats, oils and waxes. 22,680. September 25. (Germany, November 14, 1923.)

Soc. Anon. le Petrole Synthétique. Synthetic manufacture of hydrocarbons. 22,322. September 22. (France, October 19, 1923.)

Soc. Chimique de la Grande Paroisse, Azote et Produits Chimiques. Production of mixed ammonium and potassium salts. 22,575. September 24. (France, November 8, 1923.)

Sutcliffe, E. R. Manufacture of fuel. 22,365. September 22.

Synthetic Ammonia and Nitrates, Ltd. Method of producing nitrogen-hydrogen mixture for synthetic production of ammonia. 22,268. September 22. (United States, September 21, 1923.)

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing those firms' independent and impartial opinions.*

London, October 2, 1924.

Business has been decidedly better during the past week. In nearly every direction a much more optimistic tone is apparent and it seems possible that we are on the eve of better times. Quite a considerable volume of business for Home Trade account has been concluded during the past week. In the export market one or two lines have been quite brisk and a better inquiry all round is evident.

General Chemicals

ACETONE is a firm market with an advancing tendency. Quite a steady business is passing with price at from £93 to £95 per ton.

ACID ACETIC is in steady demand. Technical remains unchanged at £44 per ton and pure at £45 per ton. Second-hand holders who bought at lower figures are now clearing out and the market tendency is much firmer.

ACID CITRIC is only a nominal market. Price about 1s. 3d. per lb. with certain weak holders realising at rather lower levels.

ACID FORMIC is a fair market, being unchanged in value at about £53 per ton for 85 per cent.

ACID LACTIC.—The demand is rather slow and with larger quantities appearing in the market the tendency is easier.

ACID TARTARIC is a very weak market with realisation parcels offering at down to 11¼d. per lb.

ALUMINA SULPHATE.—The tendency is still in buyers' favour, owing to the fight between Continental makers. 17–18% is nominally £7 10s. per ton.

ARSENIC is quiet and uninteresting at £45 to £46 per ton.

BARIUM CHLORIDE is lower in price at £12 15s. per ton; the demand is slow.

COPPER SULPHATE.—Unchanged at about £23 per ton.

CREAM OF TARTAR is in good demand, price 80s. per cwt. less 2½%.

FORMALDEHYDE has been in better demand. Price £51 to £52 per ton.

LEAD ACETATE is in fair demand, quoted at £46 and £45 per ton.

LEAD NITRATE.—Unchanged at £43 per ton.

LIME ACETATE is very weak. The demand is poor and parcels can be picked up at £16 per ton.

METHYL ALCOHOL is slightly lower in price at about £60 per ton.

POTASSIUM CARBONATE AND CAUSTIC are quiet and unchanged.

POTASSIUM PERMANGANATE is a very poor market. Price 7¼d. per lb.

POTASSIUM PRUSSIATE is in better demand. Price is as yet unchanged at about 7½d. per lb.

SODIUM ACETATE.—A fair business is passing at £22 10s. per ton.

SODIUM HYPOSULPHITE.—Unchanged at £9 10s. per ton in bags.

SODIUM NITRITE is in fair demand at about £25 10s. per ton.

SODIUM PRUSSIATE.—A better demand is in evidence, price unchanged at 4½d. per lb.

SODIUM SULPHIDE.—Unchanged.

Bichromates

The English makers have revised their prices for bichromate of potash. The full scale of their prices for both potash and soda is as follows:

BICHROMATE OF POTASH.—European Continental ports, including Basle and Rhine ports, 4¾d. per lb.; Egypt, 4¾d. per lb.

Other markets remain unchanged, and bichromate of soda for all markets is unchanged. Below is a list of present prices:

	Anhyd. B. Soda.	Chrom. Soda.	Chrom. Tan.	Bich. Potash	Bich. Soda.
Continent	4¾d.	3¾d.	4d. less 2½d.	4¾d.	4d.
Syria and Asia Minor	4¾d.	3¾d.	4d. nett	5d.	4d.
Egypt	5d.	4d.	4d. nett	4¾d.	4¼d.
Australia	5½d.	4½d.	4½d. less 2½d.	5½d.	4¾d.
China and Japan	5d.	4d.	4¼d. nett	5d.	4¼d.
Mexico	5⅛d.	4⅛d.	4¼d. nett	5⅛d.	4⅜d.
India	4¾d.	3¾d.	4d. nett	5d.	4d.
Oversea general	5d.	4d.	4d. nett	5d.	4¼d.

Shipment to Canada or France excepted.

OXIDE OF CHROMIUM.—1s. 1d. per lb., all packages free.

CHROMIC ACID.—1s. 0½d. per lb.

BICHROMATE OF AMMONIA.—8¼d. per lb.

CHROMATE OF POTASH.—10d. per lb.

Coal Tar Products

There is little change to report in the market for coal tar products, as far as prompt business is concerned.

90% BENZOL is quoted at 1s. 5½d. to 1s. 6d. per gallon on rails.

PURE BENZOL is quoted at 1s. 9d. to 1s. 10d. per gallon on rails.

CREOSOTE OIL remains unchanged at from 5¼d. to 5½d. per gallon on rails in the North, and 6d. to 6¼d. per gallon in London.

CRESYLIC ACID remains quietly steady at 1s. 11½d. to 2s. per gallon on rails for the pale quality 97/99%, while the dark quality 95/97% is worth 1s. 8d. to 1s. 9d. per gallon.

SOLVENT NAPHTHA is slightly firmer at 11d. to 1s. per gallon on rails.

HEAVY NAPHTHA remains unchanged at 10d. to 11d. per gallon.

NAPHTHALENES of all grades are still available in considerable quantities, while the demand remains poor. Low grades are obtainable at from £3 5s. to £4 per ton on rails, whilst of the higher grades the 74/76 quality is quoted at about £5 10s. to £6 per ton, and the 76/78 quality at about £6 to £7 per ton.

PITCH continues to weaken, owing to the scarcity of buying orders. To-day's prices are:—London, 42s. 6d. to 45s., f.o.b.; East Coast, 40s. to 42s. 6d., West Coast, 40s. f.o.b.

SULPHATE OF AMMONIA.—The demand is quieter. Prices remain unchanged.

Nitrogen Products Market

THERE has been practically no change whatever in the position of either the export or home market since last week's report.

With regard to nitrate of soda the market is firmer, the spot price being £11 11s. to £11 13s. per ton, and the forward shipment £12 5s. to £12 15s. per ton, c.i.f. The total sales of nitrate for shipment after July 1 last amount to 1,680,000 tons.

Bentonite Supplies

IN reference to recent inquiries respecting supplies of Bentonite, we understand that F. W. Berk and Co., Ltd., 1, Fenchurch Avenue, London, have a few 100 lb. bags at their Stratford works for disposal.

Death of Mr. Frederick Boehm

In London chemical circles the news will be received with general regret of the death of Mr. Frederick Boehm, which took place on Monday, following an operation, at his residence, Sudbury House, Harrow. Mr. Boehm, who was 62 years of age, was the managing director of the well-known firm of F. Boehm, Ltd., chemical merchants, 17, Jewry Street, London, which he founded many years ago and with which he was actively associated up to the time of his death. The cremation took place at Golder's Green yesterday (Friday).

Smoke Abatement Conference

Mr. C. ELLIOTT, of Manchester, honorary secretary of the Smoke Abatement League of Great Britain, forwards a programme of the Conference to be held in Manchester on November 4-6. On November 5 the subject of "Low Temperature Carbonisation and Smokeless Fuel" will be dealt with, and at the evening session papers will be read on "Pulverised Coal" and "The Complete Gasification of Coal, its bearing upon Smoke Prevention and Fuel Economy." Speakers during the Conference will include Sir Arthur Duckham, President of the Institute of Chemical Engineers, and Professor Cohen, of Leeds. An exhibition is to be held at the same time.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at sellers' works.

General Heavy Chemicals

Acid Acetic 40% Tech.—£23 10s. per ton.

Acid Boric, Commercial.—Crystal, £45 per ton. Powder, £47 per ton

Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d., according to purity, strength and locality..

Acid Nitric 80° Tw.—£21 10s. to £27 per ton, makers' works according to district and quality.

Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.

Bleaching Powder.—Spot, £11 d/d.; Contract, £10 d/d. 4 ton lots.

Bisulphite of Lime.—£7 per ton, packages extra.

Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chloride.—£5 17s. 6d. per ton d/d.

Copper Sulphate.—£25 per ton.

Methylated Spirit 64 O.P.—Industrial, 2s. 7d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.

Nickel Sulphate.—£38 per ton d/d. Normal business.

Nickel Ammonia Sulphate.—£38 per ton d/d. Normal business.

Potash Caustic.—£30 to £33 per ton.

Potassium Bichromate.—5½d. per lb.

Potassium Chlorate.—3d. to 4d. per lb.

Salammoniac.—£32 per ton d/d.

Salt Cake.—£3 10s. per ton d/d.

Soda Caustic, Solid.—Spot lots delivered, £16 7s. 6d. to £19 7s. 6d. per ton, according to strength; 20s. less for contracts.

Soda Crystals.—£5 5s. to £5 10s. per ton ex railway depots or ports.

Sodium Acetate 97/98%.—£24 per ton.

Sodium Bicarbonate.—£10 10s. per ton carr. paid.

Sodium Bichromate.—4½d. per lb.

Sodium Bisulphite Powder 60/62%.—£17 to £18 per ton according to quantity, f.o.b., 1-cwt. iron drums included.

Sodium Chlorate.—3d. per lb.

Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool. Nominal.

Sodium Nitrite 100% basis.—£27 per ton d/d.

Sodium Sulphide conc. 60/65.—About £14 10s. per ton d/d.

Sodium Sulphide Crystals.—£9 per ton d/d.

Sodium Sulphite, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—6½d. per lb. Quiet. Crude 60's, 1s. 7d. to 1s. 11d. per gall.

Acid Cresylic 97/99.—2s. to 2s. 1d. per gall. Demand fair. Pale 95%, 1s. 9d. to 2s. 1d. per gall. Not much inquiry. Dark, 1s. 9d. to 1s. 11d. per gall. Quiet.

Anthracene Paste 40%.—4d. per unit per cwt. Nominal price. No business.

Anthracene Oil, Strained.—6½d. to 7½d. per gall. Quiet. Unstrained, 7d. to 7½d. per gall.

Benzol.—Crude 65's.—7½d. to 9d. per gall., ex works in tank wagons. Standard Motor, 1s. 1½d. to 1s. 3d. per gall., ex works in tank wagons. Pure, 1s. 5½d. to 1s. 7d. per gall., ex works in tank wagons.

Toluol.—90%, 1s. 5d. to 1s. 5½d. per gall. Pure, 1s. 8d. to 2s. per gall.

Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.

Creosote.—Cresylic, 20/24%, 8½d. per gall. Better demand. Middle Oil, Heavy, Standard specification, 5½d. to 6d. per gall., according to quality and district. Small export inquiry. Fair demand.

Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 11d. to 1s. 2d. per gall., according to district. Steady market. Solvent 90/190, 11d. to 1s. per gall. Not much demand.

Naphthalene Crude.—Market dull. Cheaper in Yorkshire than in Lancashire. Drained Creosote Salts, £4 to £6 per ton. Quiet. Whizzed or hot pressed, £7 to £9 per ton.

Naphthalene.—Crystals and Flaked, £12 to £13 per ton.

Pitch.—Medium soft, 40s. to 50s. per ton, f.a.s. for next season. Frequent inquiries.

Pyridine.—90/160, 19s. per gall. Steady demand. Heavy, 12s. Little business.

Intermediates and Dyes

Improvement in Dyestuffs business maintained, but orders are still for small quantities. Consumers' stocks probably very low.

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.

Acid H.—3s. 11d. per lb. 100% basis d/d.

Acid Naphthionic.—2s. 4d. per lb. 100% basis d/d.

Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.

Acid Salicylic, technical.—1s. 1d. per lb. Improved demand.

Acid Sulphanilic.—9½d. per lb. 100% basis d/d.

Aluminium Chloride, anhydrous.—1s. per lb. d/d.

Aniline Oil.—8d. per lb. naked at works.

Aniline Salts.—8½d. per lb. naked at works.

Antimony Pentachloride.—1s. per lb. d/d.

Benzidine Base.—4s. per lb. 100% basis d/d.

Benzyl Chloride 95%.—1s. 1d. per lb.

p-Chlorphenol.—4s. 3d. per lb. d/d.

p-Chloraniline.—3s. per lb. 100% basis.

o-Cresol 19/31° C.—4½d. per lb. Rather quiet.

m-Cresol 98/100%.—2s. 1d. to 2s. 3d. per lb. Demand moderate.

p-Cresol 32/34° C.—2s. 1d. to 2s. 3d. per lb. Demand moderate.

Dichloraniline.—2s. 3d. to 3s. per lb.

Dichloraniline S. Acid.—2s. 6d. per lb. 100% basis.

p-Dichlorbenzol.—£85 per ton.

Diethylaniline.—4s. 6d. per lb. d/d., packages extra, returnable.

Dimethyaniline.—2s. 3d. per lb. d/d. Drums extra.

Dinitrobenzene.—9d. to 10d. per lb. naked at works.

Dinitrochlorbenzol.—£84 10s. per ton d/d.

Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works. 66/68° C. 1s. 2d. per lb. naked at works.

Diphenylaniline.—2s. 10d. per lb. d/d.

Monochlorbenzol.—£63 per ton.

B-Naphthol.—1s. per lb. d/d.

a-Naphthylamine.—1s. 4d. per lb. d/d.

B-Naphthylamine.—4s. per lb. d/d.

m-Nitraniline.—4s. 3d. per lb. d/d.

p-Nitraniline.—2s. 3d. per lb. d/d.

Nitrobenzene.—5½d. to 5¾d. per lb. naked at works.

o-Nitrochlorbenzol.—2s. per lb. 100% basis d/d.

Nitronapthalene.—10½d. per lb. d/d.

p-Nitrophenol.—1s. 9d. per lb. 100 % basis d/d.

p-Nitro-*o*-amido-phenol.—4s. 6d. per lb. 100% basis.

m-Phenylene Diamine.—3s. 11d. per lb. d/d.

p-Phenylene Diamine.—10s. 2d. per lb. 100% basis d/d.

R. Salt.—2s. 5d. per lb. 100% basis d/d.

Sodium Naphthionate.—2s. 3d. per lb. 100% basis d/d.

o-Toluidine.—8½d. per lb.

p-Toluidine.—3s. 3d. to 4s. 2d. per lb. naked at works.

m-Toluylene Diamine.—4s. per lb. d/d.

Wood Distillation Products

Acetate of Lime.—Brown £12 per ton d/d. Grey £16 per ton. Market easier. Liquor, 9d. per gall. 32° Tw.

Charcoal.—£7 15s. to £9 5s. per ton, according to grade and locality. Market brisker.

Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw.

Red Liquor.—10d. to 1s. per gall. 14/15° Tw.

Wood Creosote.—2s. 9d. per gall. Unrefined.

Wood Naphtha, Miscible.—4s. 10d. per gall. 60% O.P. Market dull. Solvent, 5s. 3d. per gall. 40% O.P. Fairly good demand.

Wood Tar.—£4 5s. per ton. Cheaper.

Brown Sugar of Lead.—£43 per ton. Cheaper.

Rubber Chemicals

Antimony Sulphide.—Golden, 5½d. to 1s. 4d. per lb., according to quality. Crimson, 1s. 3d. to 1s. 6d. per lb., according to quality.

Arsenic Sulphide, Yellow.—1s. 11d. per lb.

Barytes.—£3 10s. to £6 15s. per ton, according to quality.

Cadmium Sulphide.—3s. 9d. to 4s. per lb., according to quantity.

Carbon Bisulphide.—£30 to £33 per ton, according to quantity. Again dearer.

Carbon Black.—7d. to 7½d. per lb., ex-wharf. Dearer.

Carbon Tetrachloride.—£60 to £65 per ton, according to quantity, drums extra. Again dearer.

Chromium Oxide, Green.—1s. 3d. per lb.

Indiarubber Substitutes, White and Dark.—5d. to 9½d. per lb. Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.

Lamp Black.—£48 per ton, barrels free.

Lead Hyposulphite.—7½d. per lb.

Lithopone, 30%.—£22 10s. per ton.

Mineral Rubber "Rubpron."—£16 5s. per ton f.o.r. London.

Sulphur.—£10 to £12 per ton, according to quality.
Sulphur Chloride.—4d. per lb., carboys extra. Dearer.
Thiocarbanilide.—2s. 6d. per lb.
Vermilion, Pale or Deep.—5s. 1d. per lb. Dearer.
Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality.

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£47 per ton. Firmer.
Acid, Acetyl Salicylic.—3s. to 3s. 3d. according to quality.
Acid, Benzoic B.P.—3s. to 3s. 6d. per lb.
Acid, Boric B.P.—Crystal £51 per ton, Powder £55 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 3½d. to 1s. 4½d. per lb., less 5% for ton lots. Market very weak.
Acid, Gallic.—3s. per lb. for pure crystal.
Acid, Pyrogallic, Crystals.—6s. 9d. per lb. for 1 cwt. lots. Market firm. Increasing demand.
Acid, Salicylic.—1s. 5d. to 1s. 8d. per lb. According to quantity.
Acid, Tannic B.P.—2s. 10d. per lb. Market quiet.
Acid, Tartaric.—1s. 1½d. per lb., less 5%.
Amidol.—9s. per lb. d/d.
Acetanilide.—2s. 1d. to 2s. 3d. per lb. for quantity. Demand slow.
Amidopyrin.—13s. 3d. per lb. Neglected. Stocks low.
Ammonium Benzoate.—3s.3d. to 3s.6d. per lb. according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. 6d. per oz. for English make.
Barbitone.—15s. to 15s. 6d. per lb. Quiet market.
Benzonaphthol.—5s. 3d. per lb. Small inquiry.
Bismuth Salts.—Prices reduced by about 1s. 3d. to 2s. 3d. per lb. on account of the fall in the price of the metal.
Bismuth Carbonate.—10s. 6d. to 12s. 6d. per lb.
Bismuth Citrate.—10s. 3d. to 12s. 3d. per lb.
Bismuth Salicylate.—9s. od. to 11s. od. per lb.
Bismuth Subnitrate.—9s. 8d. to 10s. 8d. per lb.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 4d. to 1s. 7d. per lb.; sodium, 1s. 5d. to 1s. 8d. per lb.; ammonium, 1s. 6d. to 1s. 9d. per lb. Market firm and Continental prices fully maintained with upward tendency.
Calcium Lactate—1s. 7d. to 2s. according to quantity. Fair demand and steady market.
Chloral Hydrate.—4s. to 4s. 3d. per lb. Market easier after recent firmness.
Chloroform.—2s. per lb. for cwt. lots. Very steady.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£49 per ton, ex works. English make in casks. About 8s. per cwt. extra for carboys.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—10s. 6d. to 11s. 3d. per lb.
Hexamine.—3s. 1d. to 3s 3d. per lb.
Homatropine Hydrobromide.—30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb. for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—2s. 1d. to 2s. 5d. per lb., according to quantity.
Magnesium Carbonate.—Light Commercial, £36 per ton net.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £25 per ton, less 2½%; Heavy Pure, 1s. 6d. to 2s. per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 53s. 6d. per lb. Cheaper. Synthetic, 26s. to 35s. per lb., according to quantity. English make.
Mercurials.—Market very quiet. Red oxide, 5s. 3d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 6d. to 3s. 7d. per lb.; white precipitate, 4s. 7d. to 4s. 8d. per lb.; Calomel, 3s. 11d. to 4s. per lb.
Methyl Salicylate.—1s. 10d. to 2s. per lb.
Methyl Sulphonel.—26s. per lb.
Metol.—11s. per lb. British make.
Morphine and Salts.—Reduced by 1s. to 1s. 3d. per oz.
Paraformaldehyde.—2s. 6½d. for cwt. lots.
Paraldehyde.—1s. 6d. per lb. in free bottles and cases.
Phenacetin.—5s. 9d. per lb.
Phenazone.—7s. 2d.
Phenolphthalein.—5s. 6d. to 6s. per lb. in cwt. lots.
Potassium Bitartrate 99/100% (Cream of Tartar).—88s. per cwt. less 2½% for ton lots. Firm market. Prices have upward tendency.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb. Dearer.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Good steady demand.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., carriage paid; commercial, 8d. to 8½d. per lb., carriage paid. Keen competition keeps prices low.
Quinine Sulphate.—2s.3d. to 2s. 4d. per oz., in 100 oz. tins. Good market.
Resorcin.—5s. 6d. per lb.
Saccharin.—63s. per lb. in 50-lb. lots.
Salol.—3s. 6d. to 4s. per lb.
Silver Proteinate.—9s. 6d. per lb.
Sodium Benzoate, B.P.—2s. 9d. per lb. Ample supplies B.P. quality available.
Sodium Citrate, B.P.C., 1923.—1s. 11d. to 2s. 2d. per lb., according to quantity.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton, according to quantity, d/d. consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb. Less for quantity.
Sodium Potassium Tartrate (Rochelle Salt).—75s. to 82s. 6d. per cwt., according to quantity. Market steady, good demand.
Sodium Salicylate.—Powder, 2s. to 2s. 3d. per lb. Crystal, 2s. 3d. to 2s. 5d. per lb. Flake, 2s. 9d. per lb. Market rather easier.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb., according to quantity.
Sodium Sulphite, anhydrous, £27 10s. to £28 10s. per ton, according to quantity, 1 cwt. kegs included. In large casks £1 per ton less.
Sulphonal.—15s. per lb. Easier.
Thymol.—17s. 6d. per lb. Very scarce indeed.

Perfumery Chemicals

Acetophenone.—12s. 6d. per lb.
Aubepine.—15s. 3d. per lb. Advanced.
Amyl Acetate.—2s. 6d. per lb. Cheaper.
Amyl Butyrate.—6s. 9d. per lb.
Amyl Salicylate.—3s. 3s. per lb. Dearer.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 9d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 9d. per lb.
Benzaldehyde free from Chlorine.—3s. 6d. per lb.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—18s. 9d. per lb. Advanced.
Coumarin.—19s. 6d. per lb. Cheaper.
Citronellol.—17s. per lb. Again advanced.
Citral.—8s. per lb. Cheaper.
Ethyl Cinnamate.—12s. 6d. per lb. Cheaper.
Ethyl Phthalate.—3s. 3d. per lb.
Eugenol.—10s. per lb. Cheaper.
Geraniol (Palmarosa).—35s. per lb.
Geraniol.—11s. to 18s. 6d. per lb.
Heliotropine.—6s. 9d. per lb. Cheaper.
Iso Eugenol.—15s. 9d. per lb.
Linalol ex Bois de Rose.—26s. per lb.
Linalyl Acetate.—26s. per lb.
Methyl Anthranilate.—9s. 6d. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ambrette.—50s. per lb. Dearer.
Musk Xylol.—13s. 6d. per lb. Again cheaper.
Nerolin.—4s. 9d. per lb. Advanced.
Phenyl Ethyl Acetate.—15s. per lb. Advanced.
Phenyl Ethyl Alcohol.—16s. per lb.
Rhodinol.—60s. per lb. Advanced.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 4d. per lb. Cheaper.
Vanillin.—26s. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—2s. 8d. per lb.
Bergamot Oil.—17s. 6d. per lb. Again firmer.
Bourbon Geranium Oil.—36s. per lb.
Camphor Oil.—65s. per cwt.
Cananga Oil, Java.—10s. per lb. Cheaper.
Cinnamon Oil, Leaf.—6½d. per oz.
Cassia Oil, 80/85%.—10s. per lb. Advanced.
Citronella Oil.—Java, 85/90%, 5s. 9d. per lb. Ceylon, 3s. 7d. per lb.
Clove Oil.—7s. 6d. per lb. Cheaper.
Eucalyptus Oil, 70/75%.—2s. 3d. per lb. Cheaper.
Lavender Oil.—French 38/40% Esters, 27s. 6d. per lb. Cheaper.
Lemon Oil.—3s. per lb.
Lemongrass Oil.—4s. 6d. per lb.
Orange Oil, Sweet.—11s. per lb.
Otto of Rose Oil.—Bulgarian, 40s. per oz. Dearer. Anatolian, 18s. per oz.
Palma Rosa Oil.—16s. 6d. per lb. Cheaper.
Peppermint Oil.—Wayne County, 30s. per lb. Japanese, 17s. 3d. per lb. English, 65s. per lb.
Petitgrain Oil.—9s. 3d. per lb.
Sandal Wood Oil.—Mysore, 26s. 7d. per lb. Australian, 21s. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, October 2, 1924.

Business in the Heavy Chemical Market has again been quieter during the past week, inquiries received being in most cases only for small quantities. Prices quoted are in some cases merely nominal, counter offers being quite easily negotiable in the case of little called for spot material.

Industrial Chemicals

ACID ACETIC.—Good inquiry both for home consumption and export. Glacial 98/100%, £58 to £69 per ton; 80%, pure, £45 to £46 per ton; 80%, technical, £44 to £45 per ton, all packed in casks delivered c.i.f. U.K. ports, duty free.

ACID BORACIC.—Crystal or granulated, £45 per ton; powdered, £47 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Nominally 6d. per lb. delivered, but could probably be obtained for less.

ACID CITRIC, B.P. CRYSTALS.—In little demand and price unchanged at 1s. 4d. per lb., less 5% ex store.

ACID FORMIC, 85%.—Spot lots quoted £55 7s. 6d. per ton ex store. On offer from the continent at about £52 10s. per ton c.i.f. U.K. port.

ACID HYDROCHLORIC.—In little demand, price 6s. 6d. per carboy ex works.

ACID NITRIC, 80°.—£23 10s. per ton ex station, full truck loads.

ACID OXALIC, 98/100%.—Spot lots quoted 4d. per lb. ex store or station. Offered for prompt shipment from the continent at about 3¾d. per lb. c.i.f. U.K. port.

ACID SULPHURIC, 144°.—£3 12s. 6d. per ton; 168°, £7 per ton ex works, full truck loads. Dearsenicated quality 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Unchanged at about 1s. per lb., less 5 per cent. ex store. Little demand.

ALUMINA SULPHATE, 17/18%, IRON FREE.—Unchanged at about £8 per ton ex store. Quoted £7 5s. per ton c.i.f. U.K. port, prompt shipment.

ALUM.—Ammonium chrome alum on offer at £17 to £18 per ton, according to quality, f.o.b. U.K. port for export. Lump potash alum quoted £9 12s. 6d. per ton ex store, spot delivery. Offered for prompt shipment from the continent at about £8 7s. 6d. per ton c.i.f. U.K. port.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 6d. per lb. ex station. Containers extra and returnable, with possible slight reduction for large quantities.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5 cwt. casks delivered U.K. port.

AMMONIA LIQUID, 880°.—In steady demand. Unchanged at 2½d. to 3d. per lb. delivered, according to quantity, containers extra.

AMMONIA MURIATE.—Gray galvanizers' crystals of English manufacture unchanged at about £30 per ton ex station; fine white crystals offered from the continent at £24 per ton c.i.f. U.K. port.

ARSENIC, WHITE POWDERED.—In little demand. Spot lots available at about £50 per ton ex store.

BARIUM CARBONATE, 98/100% POWDERED.—Quoted £9 10s. per ton c.i.f. U.K. port, prompt shipment from the continent.

BARIUM CHLORIDE, 98/100%.—Spot material quoted £14 per ton ex store. Slightly cheaper quotations from the continent. Crystals quoted £11 15s. per ton c.i.f. U.K. port.

BARYTES.—English material unchanged at £5 5s. per ton ex works. Continental quoted £5 per ton c.i.f. U.K. port.

BLEACHING POWDER.—Spot lots £11 per ton ex station, contracts 20s. per ton less.

BORAX.—Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton ex station. Offered from the continent at £4 17s. 6d. per ton c.i.f. U.K. port.

COPPERAS, GREEN.—Unchanged at about £3 per ton ex works, packed in casks, free.

COPPER SULPHATE.—Moderate inquiry for export. Now quoted £24 5s. per ton f.o.b. U.K. port. Continental material on offer at about £23 5s. per ton ex quay.

FORMALDEHYDE, 40%.—Spot lots now available at about £50 to £51 per ton ex store.

GLAUBER SALTS.—English material quoted £4 per ton ex store or station. Fine white crystals offered from the continent at £3 5s. per ton c.i.f. U.K. port, large crystals 10s. per ton extra.

LEAD, RED.—Imported material now on offer at £41 per ton ex store, spot delivery.

LEAD, WHITE.—Offered at £43 15s. per ton ex store, spot delivery.

LEAD ACETATE.—White crystals quoted £45 5s. per ton ex store, spot delivery, brown on offer from the continent at £39 2s. 6d. per ton c.i.f. U.K. port.

MAGNESITE, CALCINED.—Unchanged at about £7 17s. 6d. per ton ex station, prompt delivery. Hard burnt quality quoted £4 15s. per ton ex station. Finer quality of continental manufacture quoted £7 15s. per ton c.i.f. U.K. port.

MAGNESIUM CHLORIDE.—Quotations from the continent again higher. Now quoted £4 7s. 6d. per ton c.i.f. U.K. port. Spot lots available at about £4 15s. per ton ex store.

POTASH CAUSTIC, 88/92%.—Spot lots unchanged at about £30 per ton ex store. On offer from the continent at £28 10s. per ton c.i.f. U.K. port.

POTASSIUM BICHROMATE.—Unchanged at 5½d. per lb. delivered.

POTASSIUM CARBONATE.—96/98% quality £22 5s. per ton c.i.f. U.K. port. Spot lots available at about £24 15s. per ton ex store. 90/94% quality £20 7s. 6d. per ton c.i.f. U.K. port.

POTASSIUM CHLORATE.—Offered for prompt shipment from the continent at about 2¾d. per lb. ex wharf, spot lots quoted 3d. per lb. ex store.

POTASSIUM NITRATE, SALTPETRE.—Quoted £26 per ton c.i.f. U.K. port, prompt shipment from the continent. Spot lots on offer at £28 15s. per ton ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 6d. per lb. ex wharf, prompt shipment from the continent. Spot lots available at about 8d. per lb. ex store.

POTASSIUM PRUSSIATE, YELLOW.—Cheaper quotations from the continent. Now quoted 6¾d. per lb. ex wharf, prompt shipment.

SODA, CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62%, broken, £19 2s. 6d. per ton; 98/99%, powdered, £22 15s. per ton. All ex station, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Spot lots quoted £22 15s. per ton ex store. On offer from the continent at about £21 15s. per ton c.i.f. U.K. port.

SODIUM BICARBONATE.—Refined recrystallised quality £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4¼d. per lb. delivered.

SODIUM CARBONATE, SODA CRYSTALS.—£5 to £5 5s. per ton ex quay or station. Powdered or pea quality £1 7s. 6d. per ton more; Alkali 58%, £8 12s. 3d. per ton ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton ex station. Continental on offer at about £9 7s. 6d. per ton ex store. Quoted £8 5s. per ton c.i.f. U.K. ports. Prompt shipment from the continent. Pea crystals of English manufacture unchanged at £13 15s. per ton ex station.

SODIUM NITRATE.—Ordinary quality quoted £13 7s. 6d. per ton ex store. 96/98% refined quality quoted 7s. 6d. per ton extra.

SODIUM NITRITE, 100%.—In little demand. Spot lots on offer at £26 per ton ex store.

SODIUM PRUSSIATE, YELLOW.—Nominally 4d. per lb. but could probably be obtained for less.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption £3 10s. per ton carriage paid buyer's station. Good inquiry for export and price about £3 per ton f.o.b. U.K. port.

SODIUM SULPHIDE.—60/65%, solid, of English manufacture £14 15s. per ton ex station; broken, £1 per ton more; flake, £2 per ton more. 60/62%, solid, offered from the continent at £12 10s. per ton c.i.f. U.K. port; broken, £1 2s. 6d. per ton extra. 31/34%, crystals of English manufacture £9 2s. 6d. per ton ex station; 30/32%, crystals, offered from the continent at £8 12s. 6d. per ton c.i.f. U.K. port.

SULPHUR.—Flowers, £9 10s. per ton; roll, £8 10s. per ton; rock, £8 7s. 6d. per ton; ground, £8 5s. per ton; ex store, prices nominal.

ZINC CHLORIDE.—98/100%, solid, offered from the continent at about £24 5s. per ton, c.i.f. U.K. port. 96/98% quoted £23 10s. per ton c.i.f. U.K. port. English material for export about £26 per ton f.o.b. U.K. port.

ZINC SULPHATE.—Spot lots of continental material available at £11 10s. per ton ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

AMIDO SALICYLIC ACID.—Export inquiry. Price 8s. 6d. lb. 100% basis, f.o.b.

BETA NAPHTHOL.—In good demand. Price 11½d. lb. carriage paid.

DIMETHYLANILINE.—Moderate export inquiry. Price 2s. 2½d. lb. f.o.b. drums included.

G SALT.—Some export inquiry. Price 2s. 6d. lb. 100% basis, f.o.b.

META TOLUYLENE DIAMINE.—Export inquiry. Price 3s. 11d. lb. f.o.b. U.K. port.

META PHENYLENE DIAMINE.—Export inquiry. Price 3s. 11d. lb. f.o.b. U.K. port.

MONO NITRO NAPHTHALENE.—Small inquiry. Price 10d. lb. carriage paid.

PARA PHENYLENE DIAMINE.—Export inquiry. Price 9s. 9d. lb. 100% basis f.o.b.

The Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, October 2, 1924.

There has been little change in the general level of chemical products since my last report. In some instances a slight weakness is still to be observed, but generally speaking the tone is fairly steady. A more cheerful feeling seems to be about, largely the result of the brighter outlook in the cotton textile industry, and it is expected, if this is maintained, that a bigger volume of buying of many of the leading lines of chemicals will shortly be experienced. At the moment, business is on a quietly steady scale and largely for spot or near delivery transactions.

Heavy Chemicals

Sulphide of sodium continues to sell in small quantities, although values are steadier, 60–65 per cent. concentrated solid being on offer at about £14 10s. per ton and crystals at £9 10s. Prussiate of soda is unchanged from last week at 3¾d. to 4d. per lb., with the demand for this material continuing on quiet lines. Caustic soda is in fairly good request both for home users and for export; quotations are firmly maintained at from £16 17s. 6d. per ton from 60 per cent. strength to £19 7s. 6d. for 76–77 per cent. Alkali is steady and moderately active at £6 15s. per ton. Saltcake is quiet, although values are unchanged at about £3 10s. per ton. Bleaching powder is still offering at £10 per ton, but the demand continues poor. Hyposulphite of soda is quiet but steady at £14 to £14 5s. per ton for photographic crystals and £9 10s. for commercial quality. Glauber salts are inactive at round £3 10s. per ton. Acetate of soda is about maintained at last week's level of £22 to £23 per ton, a fair demand being met with. Soda crystals keep quiet but fairly steady at £5 5s. per ton. Bichromate of soda attracts a fair amount of attention at 4¼d. per lb. Phosphate of soda is in small demand, but values are about unchanged at £13 10s. to £14 per ton. Chlorate of soda is steady and in moderate demand at 2½d. to 2¾d. per lb. Bicarbonate of soda is still quoted at £10 10s. per ton.

Values of both caustic potash and carbonate of potash are steady and a quietly steady demand is being experienced. Caustic is quoted at round £29 per ton for 90 per cent. material and carbonate at about £23. Permanganate of potash only attracts a small amount of attention, and quotations are rather easy at from 6¾d. to 7¼d. per lb. according to quality. Bichromate of potash keeps steady and in moderate request at 5½d. per lb. Yellow prussiate of potash meets with a quiet demand at 7d. per lb. Chlorate of potash is steady and in fair inquiry at 2¾d. per lb.

The demand for arsenic shows little or no improvement and values are not too firm; white powdered, Cornish makes, is quoted at £46 to £47 per ton, Manchester. Sulphate of copper is said to be recovering a little from the inactivity that has characterised this section of the market for some time; quotations range from £24 10s. to £25 per ton, f.o.b. Acetate of lead is about unchanged either in position or value at £45 per ton for white and £43 for brown. Commercial Epsom salts are in fair request with prices firm at £4 15s. per ton; magnesium sulphate is still on offer at £6 10s. Nitrate of lead is quiet but steady at £42 per ton.

Acids and Coal Tar Products

The demand for tartaric acid is on a small scale and prices are easy, the current value being round 1s. per lb. Citric acid is also quiet at about 1s. 4d. per lb. Acetic acid is in moderate request at £43 per ton for 80 per cent. commercial and round £68 per ton for glacial. Oxalic acid keeps rather dull and weak at about 4d. per lb.

There is not much movement in the coal-tar products. Pitch is stilll a poor market and values are easy at about £2 10s. per ton. Solvent naphtha is in much the same position at 1s. to 1s. 1d. per gallon. Cresylic acid is steady and in fair demand at 2s. 2d. per gallon. Naphthalenes are quiet at £16 per ton for refined and £5 and upwards for crude qualities. Creosote oil is inactive at 5¾d. to 6d. per gallon. Carbolic acid still attracts little attention at 6d. to 6¼d. per lb. for crystals and 1s. 10d. per gallon for crude.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

The Commercial Counsellor to the British Legation (Mr. H. H. Fox, C.M.G.), who is at present on leave in this country, will be in attendance at the D.O.T. from October 20 to October 31 inclusive, for the purpose of interviewing British manufacturers and merchants interested in export trade to China. Interviews by appointment and all applications, quoting the reference 5494/T.G., should be addressed to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W.1.

Petrol, Oils, Artificial Manures.—An agent in Geneva is desirous of obtaining the representation, on a commission basis, of British firms for the sale of petrol, oils, artificial manures, coal, chemicals, and foodstuffs. (Reference No. 336.)

Oils, Fats, Etc, for Soap Making.—An agent established at Nantes is desirous of obtaining the representation, on a commission basis, of British firms for the sale in France of oils, fats, etc., for soap making. (Reference No. 364.)

Steam Turbine Driven Centrifugal Pumps.—A report has been received from the office of H.M. Trade Commissioner in Toronto stating that the City of Toronto, Department of Works, is inviting tenders (Contract No. 58) for the supply and installation of one 10-million imperial gallon steam turbine driven centrifugal pump for high pressure fire system at the Main Pumping Station, Toronto. British firms in a position to supply British materials can obtain further particulars regarding this call for tenders on application. (Reference No. A.X./1335.)

Microscopes and Slides.—The Commercial Counsellor at Washington reports that a firm in Salt Lake City desire to receive quotations for British microscopes and microscopic slides. The name of the inquiring firm may be obtained by firms interested in the export of British made apparatus upon application. (Reference B.X./1244.)

Animal Bone Glues.—A firm in Watertown, Mass., wishes to communicate with British manufacturers or exporters of animal bone glues with a view to obtaining agencies for the eastern portion of the United States. They are prepared to act on a commission basis or would import on consignment. (Reference No. 386.)

American Market Movements

(*From "Drug and Chemical Markets."*)

Industrial chemicals have been moving in slightly better volume. Competition, however, continues keen and prices have shown little strength. Except in one or two items it is a buyers' market. Caustic potash is stronger. Barium chloride is firmer. Dyes and intermediates are only in fair demand. Coal by-products such as benzol and toluol are scarce owing to curtailed production. Prices are generally firm and steady. Chinawood oil is a strong item in the oil market. Prices are advancing owing to war activities in China. Linseed oil futures are stronger following higher seed values. Advance information on olive oil points to higher prices.

The sharp upward movement in peppermint oil during the past ten days still remains the centre of interest in the essential oil market. Heavy lots are reported to have been bought by both dealers and big consumers at a price over $5.00 per pound in the country. Oil cloves is weak and declining. Cassia is still scarce and high. The sharp advance in all denatured alcohol prices amounting to three cents per gallon has emphasised the strength of the alcohols. This advance is in addition to the regular monthly scheduled advance. Mercury has weakened on lower London cables. Podophyllin has been reduced as new crop goods are turned out.

Asafetida and ergot have strengthened this week and sales have been made at the higher prices. Buchu leaves, culvers root and caraway seed have eased off slightly. No Cartagena ipecac is available on spot. Quince seed is easier. Higher prices have been cabled for insect flowers. Senega root is in better demand.

Company News

NATIONAL MATCH FACTORY OF VENEZUELA CO.—An interim dividend of 2 per cent., tax free, has been declared, on account of the year to August 31 last.

J. CROSFIELD AND SONS, LTD.—Dividends are announced at the rate of 6½ per cent. per annum on the preference shares and 7½ per cent. per annum on the "A" preference shares.

ENGLISH MARGARINE WORKS, LTD.—The directors announce that they are unable to recommend the payment of a dividend on the preference shares for the half-year ended June 28 last.

RECKITT AND SONS, LTD.—An interim dividend of 9d. per share, less tax, is announced on the ordinary shares. This is the second dividend in respect of 1924 at 9d. per share. The interim payments last year were three at 8d. per share, the final of 1s. 6d. making 3s. 6d. per share for the year.

RIO TINTO CO., LTD.—Out of the estimated profits of the year 1924 the directors have declared an interim dividend of 10s. per share (10 per cent.) on the ordinary shares of the company. They have also declared the usual interim dividend for the six months ended June 30 last, of 2s. 6d. per share on the 5 per cent. preference shares. Both dividends are payable on and after November 1 next, less tax.

SHIP CANAL PORTLAND CEMENT CO.—The accounts for the year to March 31 last show a loss of £33,177, converting the credit brought forward into a debit of £26,962. As a result of capital reorganisation the capital has been reduced by £147,910, out of which the above debit will be extinguished, and the balance, together with £96,500 previously allocated for depreciation, is available for writing down assets.

BELL'S UNITED ASBESTOS CO., LTD.—The directors have declared an interim dividend on the ordinary shares of 6d. per share, being 2½ per cent. (actual) less income tax, on account of the profits of the current year. The dividend will be paid on October 20 to shareholders on the register on October 6, and the ordinary share transfer books will be closed from October 6 to October 18, both dates inclusive.

BRITISH GLUES AND CHEMICALS, LTD.—At the annual meeting in London on Wednesday, the chairman, Mr. T. Walton, said that during the past year they had slightly increased their output, but raw materials had increased in cost. Though in some cases realised prices had been more favourable than in the previous year, adverse conditions had affected prices of other products, and on balance they had realised a little less for their products. The company had, by energetic salesmanship, sold its increased production, and stocks were down both in value and in weight. Steady expansion of their foreign markets was particularly encouraging. It was obviously their business to reduce costs, but it was probable that foreign competitors would in due time refuse to accept living conditions which compared so unfavourably with those in this country, and that the costs of French manufacturers will have a tendency to advance when that country reverts to a policy of not only paying her way, but of paying off her indebtedness by way of increased taxation. Considerable attention was being given to research work, and it was their intention to pursue research by every means to increase efficiency in manufacture and find new uses for their products. Stringent economy with due regard to efficiency had throughout been effected, and the directors had again decided to accept no fees for their services.

Variables in Dye Tests

COMMERCIAL dyes are so complex in nature and so variable that the ordinary methods of commercial analysis are not very satisfactory for their evaluation, says the *Manchester Guardian Commercial*. The industries which make or use dyestuffs frequently resort to a practical method of test in which laboratory dyeings of the samples in question are compared with dyeings of a standard sample. A method has recently been put forward for eliminating the variables which enter into laboratory dyeing. In this system it is proposed to dye the fibre cut into very short lengths in a closed dye bath fitted with a reflux condenser to maintain a constant volume, an agitator in the bath ensuring perfect mixing. The dye bath is surrounded by an outer jacket containing a boiling liquid to keep the temperature constant. The dyeings thus made are compared under standard conditions of illumination.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to November 1, 1924.

"CARLTONIAN."

448,397. For paints, varnishes and anti-corrosives. Class 1. Wareing Bros. and Co., Carlton Street Works, 52, Carlton Street, Bolton, Lancashire; oil refiners and paint manufacturers. May 15, 1924.

450,539 and 450,540. For dyes, Class 1, and for dyes, Class 4. Wm. Edge and Sons, Ltd., 50, Raphael Street, Bolton, Lancashire; manufacturing chemists and dye merchants. July 26, 1924. (To be Associated. Sect. 24.)

450,541 and 450,542. For dyes, Class 1, and for dyes, Class 4. W. Edge and Sons, Ltd., 50, Raphael Street, Bolton, Lancashire; manufacturing chemists and dye merchants. July 26, 1924. (To be Associated. Sect. 24.)

"RIXELITE."

449,890. For chemical substances prepared for use in medicine and pharmacy. The Midland Pure Drug Company, 44, Eltham Road, West Bridgford, Nottinghamshire; makers of drugs and chemicals. July 4, 1924.

"AMETOX."

451,286. For chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd., Garden Wharf, Church Road, Battersea, London, S.W. 11; manufacturing chemists. August 25, 1924.

"DIAMOE."

450,754. For raw, or partly prepared, vegetable, animal, and mineral substances used in manufactures, not included in other classes. Class 4. Sterns, Ltd., 16, Finsbury Square, London, E.C.2; oil refiners, grease and lubricator manufacturers. August 2, 1924. (To be Associated. Sect. 24.)

Thornycroft Motor Vehicles

THE Copenhagen Motor Club of Denmark recently carried out a reliability trial over a selected course of 1,000 kilometres which was regarded as imposing the most difficult test possible on Danish roads. The result was a remarkable success by a 1909 "Thornycroft" car which has since been awarded the winning diploma.

It may not be generally known that John I. Thornycroft and Co., Ltd., produced a range of pleasure cars for many years until they relinquished the manufacture of these in 1912 to concentrate on the production of commercial motor vehicles. The achievement of the 1909 car supplies evidence of the high manufacturing standard of material and workmanship at the Basingstoke works, where many types of Thornycroft motor vehicles are now produced for commercial, passenger, or municipal services.

Recent Wills

Mr. Albert Vickers Smith, of 586, Wortley Road, Thorpe Hesley, Rotherham, manager to Newton Chambers and Co., Ltd.	£5,283
Professor Charles Hunter Stewart, D.Sc., of 6, Melville Street, Edinburgh, Professor of Public Health in the University of Edinburgh	£23,461

Tariff Changes

BASUTOLAND, BECHUANALAND, SWAZILAND.—An official notice imposes on carbonate of soda imported into Basutoland, Bechuanaland Protectorate and Swaziland respectively, from Great Britain, a dumping duty equal to the difference between the price at which carbonate of soda of a like grade is sold for home consumption in Great Britain at the time of shipment, plus f.o.b. charges, and the selling price f.o.b. to the importer in Basutoland, Bechuanaland Protectorate or Swaziland respectively; provided that the dumping duty shall not in any case exceed 25 per cent. *ad valorem*.

GIBRALTAR.—The exportation of ammunition, gunpowder, sulphur and saltpetre is prohibited.

SUDAN.—The manufacture, sale, possession and transit in, the importation into, and the exportation from the Sudan of hasdish and opium is prohibited. Certain preparations of these articles are allowed to be used, imported, etc., under prescribed conditions, for medicinal and surgical purposes.

ESTHONIA.—A Law, dated August 22, reduces to ·006 gold franc per kilog. (net weight) the duty levied on the importation into Esthonia of the following hydraulic building materials :—cement of all kinds (Portland, artificial and natural Roman, mixed, and all others) ; hydraulic accessory materials (including puzzolana, trass, santorin, earth and granulated slag) ; hydraulic lime, plaster of Paris, ground but not calcined, calcined plaster of Paris and cement pipes. The Law also provides that these goods are to be duty free on importation from the United States of America or any other country in which their importation is free of duty, and this provision will apply to United Kingdom goods.

MEXICO.—A Decree dated August 6 provides for the duty-free importation into Mexico of pitch derived from pine wood, for refining materials by means of "flotation."

POLAND.—An Order increases the Excise duties levied in Poland on alcohol.

"Science and Labour".

THOSE who read the reports of the very remarkable conference on "Science and Labour," held at Wembley on May 30 and 31, will be glad to hear that the principal papers are to be issued in book form early next month. Among the contributors to this volume (which will be issued under the title "Science and Labour" and published by Ernest Benn, Ltd.) are the following:—Sir Richard Gregory, D.Sc.; Sir Richard Glazebrook, D.Sc., F.R.S.; Lord Askwith, K.C.; Mr. Hugo Hirst; Sir Oliver Lodge, D.Sc., F.R.S.; Mr. C. T. Cramp; Lord Ashfield; Miss Margaret Bondfield, M.P.; Sir Arthur Newholme, M.D.; Mr. Arthur Greenwood, M.P.; and Mr. R. H. Tawney. The subjects dealt with by these and other contributors include: "The Place of Science in Government," "Scientific Research in Relation to Industry," "The Co-operation of Science and Labour in Production," "Science and the Human Factor," and "Science in Educational Organisation."

British Celanese Progress

AT the annual meeting of British Celanese, Ltd., held in London on September 25, the chairman, Sir Harry McGowan, referring to factory processes and costs, said that during the last few months their working costs had shown substantial improvements, due partly to increased output, but also to their workpeople becoming more familiar with the various processes, and to improvements suggested by experience. So far as one could see at the moment, it would be the end of the present year before the bulk of these improvements and alterations were completed, which, while they were being carried out, prevented the maximum capacity being reached. The difficulties formerly experienced in dyeing their material had largely disappeared. They had extended their dye-house, and were producing 80 per cent. of their own dyes. Their dye-house was open to the trade, and they invited experts to go and learn their methods. They did not wish to compete with the makers of dyestuffs, but, on the contrary, they encouraged them to study their methods and produce their own dyes. These developments on their part had given them good control of the dyeing question, and had largely removed the former dyeing difficulties. Their dyes were fast, and they had covered successfully all the shades.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that occur.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

BRITISH WHITE RUSSIAN OIL REFINERIES, LTD., Snodland. (M., 4/10/24.) Registered September 15, debenture, to bank ; general charge.

FLINN AND SON, LTD., Fishergate, dyers. (M., 4/10/24.) Registered September 20, £2,000 and £3,500 mortgages, to Sir B. S. Johnson, Abbots Lea, Woolton, and others ; charged on 7, London Road, St. Leonards-on-Sea, and 49, East Street, Brighton. *£8,850. April 2, 1924.

WYLD AND BARROW, LTD. (late WYLD, CROWTHER AND BARROW, LTD.), Manchester, manufacturing chemists. (M., 4/10/24.) Registered September 15, £1,200 debenture, to H. R. Wood, Beech House, Broom Lane, Higher Broughton, director ; charged on land in Davyhulme, also general charge.

Satisfactions

FLINN AND SON, LTD., Fishergate, dyers. (M.S., 4/10/24.) Satisfaction registered September 19, £5,000 registered August 11, 1908.

YOUNG (JOHN) (OF RADCLIFFE), LTD., bleachers, etc. (M.S., 4/10/24.) Satisfaction registered September 17, £4,000, part of amount outstanding July 1, 1908.

Receivership

CLEMENT AND JOHNSON, LTD. (R., 4/10/24.) W. S. Dawson, of 31, Great James Street, Bedford Row, W.C.1, chartered accountant, was appointed receiver and manager by Order of Court dated September 24, 1924.

New Companies Registered

TECHNICAL ADVISORY AND RESEARCH BUREAUX, 14, Victoria Street, London, S.W. Technical consultants, expert advisers, etc. Nominal capital, £1,000 in 800 "A" shares of £1 each and 4,000 "B" shares of 1s. each.

GILCOUR OIL AND DRUG CO., LTD., Blackledge, Halifax. Oil and drug merchants. Nominal capital, £2,000 in £1 shares.

A Guide to Official Statistics

BUSINESS men of a statistical turn of mind will find a ready grouping of up-to-date official compilations and returns in the second issue of the "Guide to Official Statistics," now to be obtained from the sales office of H.M. Stationery Office, Kingsway, W.C., and elsewhere, at 1s. net (1s. 4½d. post free). The volume represents the annual survey of the Permanent Consultative Committee on Official Statistics and is arranged not only to facilitate reference to every branch of Government activity, but also to furnish quickly the name of the particular department responsible for a service. The system of cross-reference simplifies matters considerably and renders it possible to trace the scope of current publications bearing upon a subject. An excellent production, in which great attention has been paid to detail, business firms will find it exceedingly informative.

Lignite Utilisation in Canada

THE High Commissioner for Canada has received for the reference library a copy of the first general report of the Lignite Utilisation Board of Canada, which contains some valuable papers dealing with the experiments which have been made in connection with the problem of carbonising and briquetting of Saskatchewan lignites. The report in question could be consulted at the Office of the High Commissioner for Canada, Kinnaird House, Pall Mall East, London, S.W.1, by engineers and others interested.